The Electrical Industry's Weekly Magazine

September 22, 1958

Electrical World

Price 50 Cents

A McGraw-Hill Publication

9th Annual Electrical Industry

FORECAST

1958 1975

FPC Defers Con Ed Natural Gas Case

. . . page 94

E B POWER GS W L
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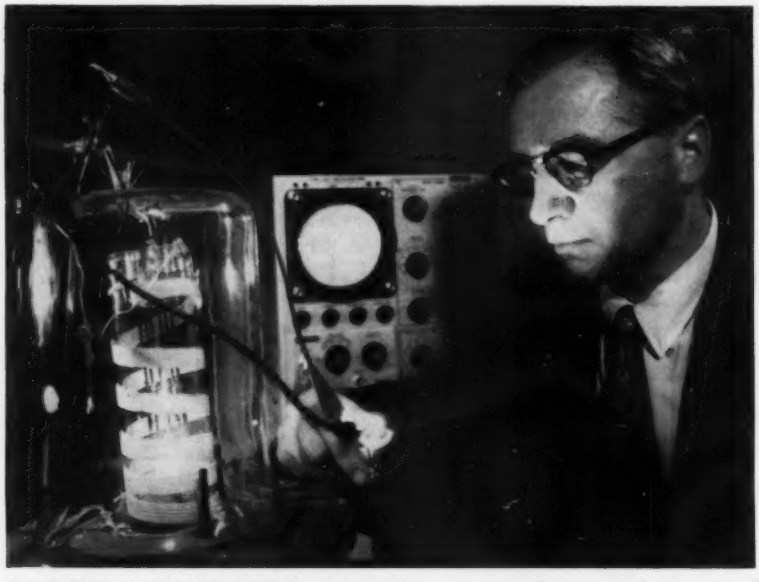
TODAY'S RESEARCH AND TOMORROW'S POWER



G.E.'S THERMIONIC CONVERTER, as a major power producer is a long way off. Pure research, however, is paying off in new ideas for improving today's generating equipment. Immediate gains are being achieved through research and development on . . .

TECHNOLOGICAL PROGRESS

General Electric's "across the board" approach to scientific research in the development of new sources of energy for generating electricity is expected to yield immediate as well as long-term improvements in power generation equipment.

TWO LONG-TERM PROSPECTS for generating electricity which appear technically and economically feasible in the years that lie ahead are—fission power and fusion power.

In addition to continued technological progress in these areas, intensive research is also being carried on to develop and utilize even more novel sources of energy—the fuel cell, direct conversion of solar energy to electricity, and the thermionic converter.

Investigations in these and other areas will undoubtedly produce unexpected payoffs which can have almost immediate application. The search for fusion power, for example, could lead to by-products in circuit technology or radiation generation long before fusion energy is harnessed for peaceful use.

SIGNIFICANT PROGRESS has already been achieved in the liquid cooling of generator stators. The nation's first large turbine-generator with water-cooled stator windings is now being manufactured by General Electric. The two generators of this cross-compound unit are each rated 265,000-kva at 30 psig hydrogen pressure.

. . . longer last-stage buckets

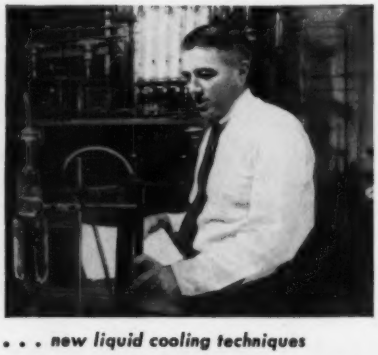
Water has over twice the heat removal ability of oil. Its use as a liquid coolant will help to open up avenues for: 1) the building of generators of up to one million kva capacity while retaining the basic design simplicity of conventionally-cooled units, 2) significant savings in power plant construction costs, and 3) overcoming the limitations on higher generator ratings imposed by current shipping restrictions.

BENEFITS TO ELECTRIC UTILITIES—By searching for new knowledge and capitalizing on existing technological opportunities, General Electric is striving for turbine-generator advances that will continue to result in low operating costs per kilowatt-hour of electricity produced. Exploring all possible avenues for technical innovations and product improvements also helps electric utilities to satisfy their needs for increased power capacity. Also, these General Electric research programs mean added value-in-use for G-E steam turbine-generators operated by electric utilities.

FOR MORE INFORMATION on today's research and tomorrow's power at General Electric, contact your local G-E Apparatus Sales Office or write for Bulletin GP-81. General Electric Company, Section 301-388, Schenectady 5, N. Y.

MORE POWER TO AMERICA

GENERAL ELECTRIC



. . . new liquid cooling techniques

. . . and increasing the capacity of steam turbine-generators.

Electrical World

Vol. 150, No. 12 SEPTEMBER 22, 1958

Published for 84 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue

CURRENT EVENTS

Decision on Con Ed Gas Case Delayed

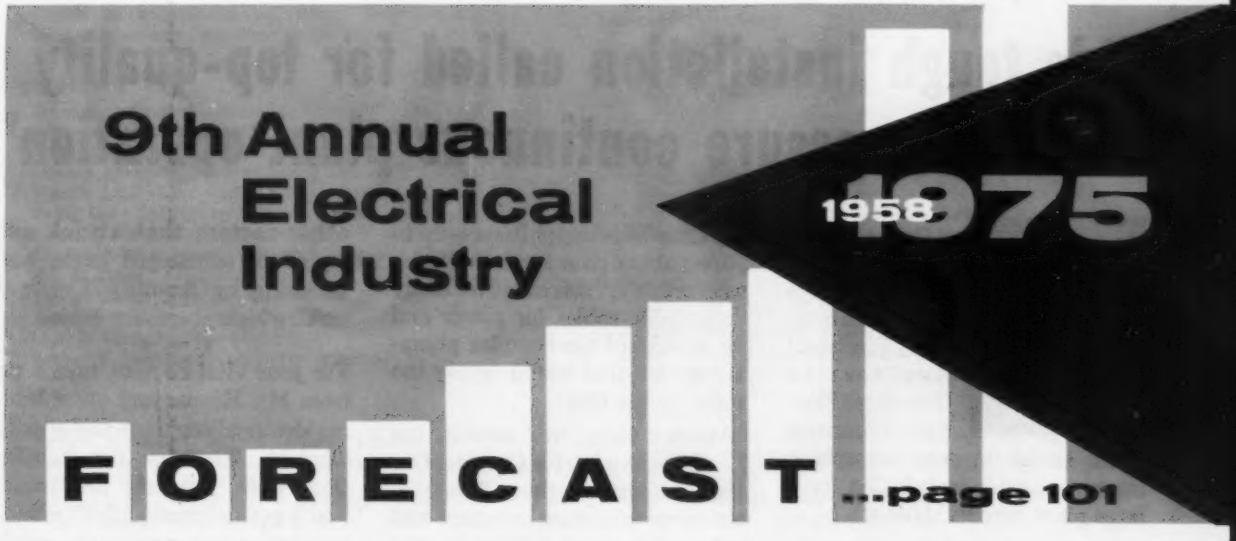
FPC Examiner Costello wants more time to study proposed purchase of natural gas to alleviate plant soot problem....p 94

BUSINESS OUTLOOK

Are We Headed for Serious Inflation?

There's no "classic" inflation in the offing, but wages and fear could push up the spiral.....p 161

A Special Report



Departments

Editorials 93
• Electrical Newsletter 21
Engineering Reference Sheet 118
Executive Reader 24
From the Publisher..... 5
How To 98
• Management Newsletter ...161
Manufacturers News 122
New Equipment 134
New Literature 180
News About People.....167
Readers Forum 182
Sales Assignments 173
Selling 152
INDEX TO ADVERTISERS...182

Soggy land and heavy reels of Okonite Cable presented a rugged installation problem. But by digging a 4-foot trench, and by "putting the Cat before the truck before the float," Guarantee Electrical Co. laid down two cables simultaneously at three miles per hour. Cables were a 15kv, 3-conductor Okolite-Okoprene submarine power cable and a 24-conductor Okolite-Okoprene submarine control cable designed to assure the continuous water supply essential to plant operation.

"We specified Okonite because...

This tough installation called for top-quality cables to assure continuous plant operation"

"Demanding assignments are 'our meat'," says Arthur Kaspar, Chief Electrical Engineer of Guarantee Electrical Company of St. Louis. "A good example is our recent cable installation for a large plant here in Missouri.

"Our client specified a never-failing, 24-hour-a-day, controlled source of plant water. The best pumping station site was miles from the plant, in low-water marsh land subject to periodic flooding from the Mississippi River—up to 25 feet above river level. One thing was certain... this called for really dependable cables for power and for control of the complex pumping station that would supply the water to the plant.

"Another thing was certain, too ... this was a job for Okonite. Our experience has taught us that Okonite gives maximum insurance and value where dependability in vital circuits is concerned."

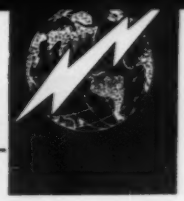
Conferences between Mr. Kaspar and Okonite developed the proper cables: unaffected by water, highly resistant to soil conditions and other factors that attack *any* buried or submerged cable, and backed up by Okonite's 78 years of making highest-quality cable.

* * *

For your vital circuits, take a tip from Mr. Kaspar and other leading electrical engineers and specify Okonite. Whatever the installation, when you talk to Okonite you'll get an unprejudiced recommendation for your cable needs because Okonite, *and only Okonite*, makes cable by all four insulating methods: strip, dip, extrusion and taping. The Okonite Company, Passaic, New Jersey.

5248

***where there's electrical power... there's* OKONITE CABLE**



Somewhere in Siberia

We can't help but be a little wary of some of the announcements of vast engineering progress that keep coming from Russia.

The latest item of substantial significance was announced at Geneva during the recent atoms-for-peace conference. There a Russian spokesman told of a 100,000 kw nuclear power plant, which was claimed to have been built somewhere in Siberia.

Only a week earlier a delegation of men prominent in the U. S. power industry had been touring Russia inspecting all sorts of thermal and hydro plants. The Russians proudly told the delegates of the 5,000 kw nuclear unit and showed fascinating films of the project. But there was never a word of the 100,000 kw unit announced the following week at Geneva.

The U. S. delegation concluded from their Russian tour and from their participation in the Geneva conference that the U. S. is far ahead of other countries in nuclear power development, in number of experimental units, and in total capacity under construction.

We can only hope that we can find ways to get newspaper reporters to carry these facts along with their gleeful presentation of stories about uneconomic and unseen plants somewhere in Siberia.

Fischer Black

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ELECTRICAL WORLD
Vol. 150, No. 12, Sept. 22, 1958

Published weekly by McGraw-Hill Publishing Co., Inc., James H. McGraw (1860-1948). Founder. **Executive, Editorial, Circulation and Advertising Offices:** McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Printed at 99-129 North Broadway, Albany 1, N. Y. See panel at right for circulation regarding subscriptions or change of address.

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United States and Canada subscription rate for individuals in the field of the publication $6.00 per year; single copies 50 cents. Other Western Hemisphere and the Philippines $20.00 payable in advance and other countries $30.00 payable in advance.

Second-class mail privileges authorized at Albany, N. Y. Title registered in U. S. Patent Office.

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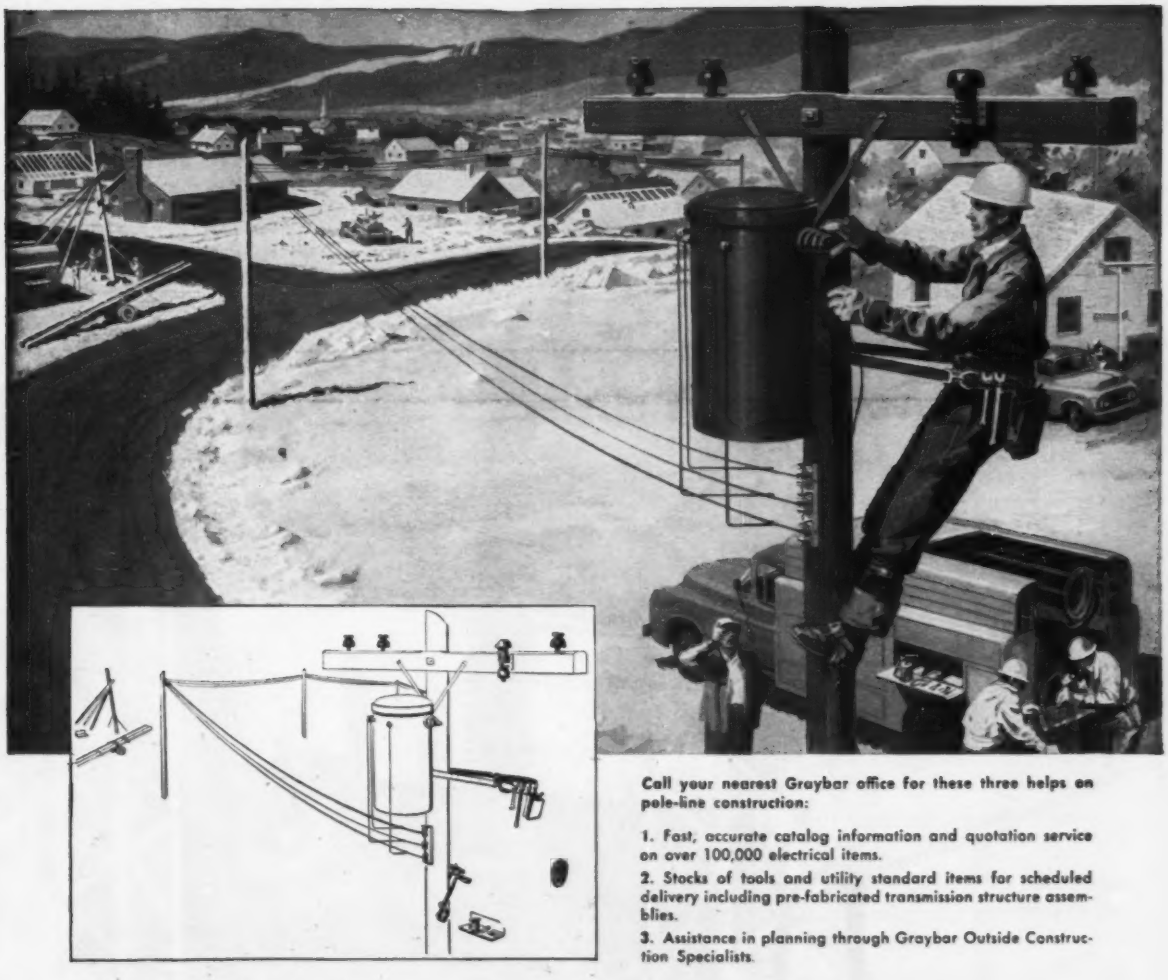

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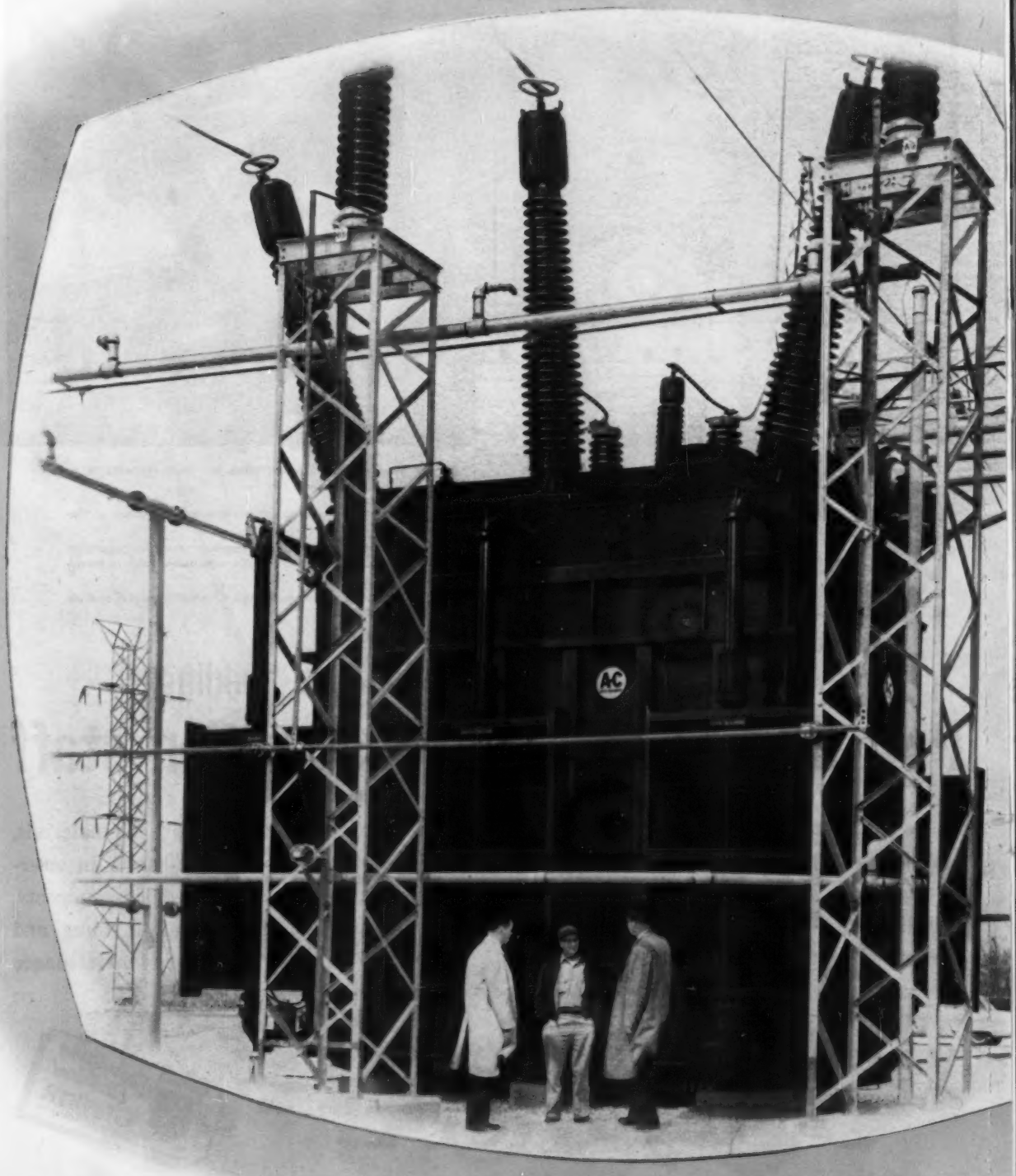
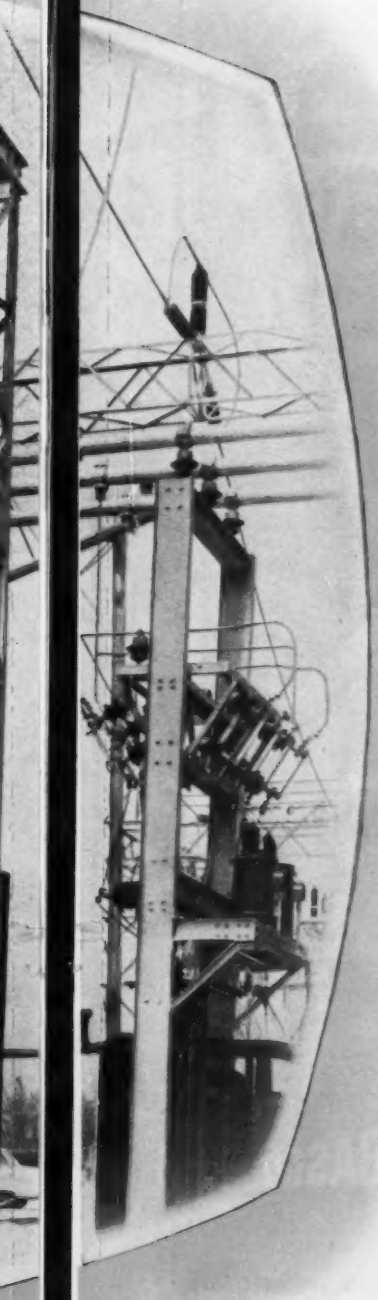
An example of Allis-Chalmers



A-C
ALLIS-CHALMERS

leadership in transformers



345,000-Volt Autotransformers for Commonwealth Edison Company

ONE of two 180,000-kva transformers recently installed at the Goodings Grove substation is shown. These units will interconnect and permit the exchange of electric power between Commonwealth Edison and the American Electric Power Company (formerly the American Gas and Electric Company).

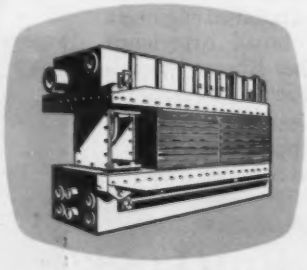
Features of these units of interest to engineers are:

- BIL is reduced two steps to 1050 kv.
- Units were subjected to both standard impulse tests and Allis-Chalmers switching surge test.

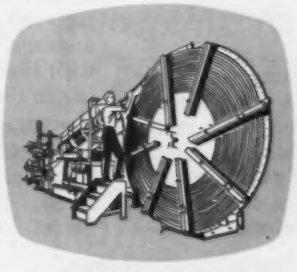
This switching surge test stresses the units differently than either impulse or low frequency tests and *scientifically* determines the ability of insulation to withstand switching surges.

- Design is corona-free to prevent insulation aging or damage due to corona.
- Weight — 480,000 pounds.
- These forced-oil-cooled units are rated 180,000 kva, 3 phase, high voltage 345 kv, low voltage 138 kv, tertiary voltage 12 kv.

For information on Allis-Chalmers transformers or test procedures, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



Integral design cuts transformer size, weight; protects core and coil against mechanical shock in shipment and service.



Circular disc type coils are ideal for resisting distortion stresses caused by heavy fault conditions.

ALLIS-CHALMERS

you can count on quality performance

Ebasco offers many consulting services to industry. In each you'll find the same stamp of quality that distinguishes the plants Ebasco designs and builds.

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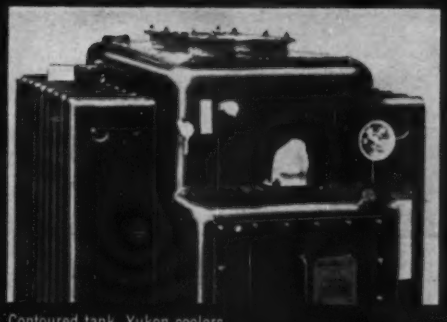
IMPROVE NETWORK RELIABILITY . . .

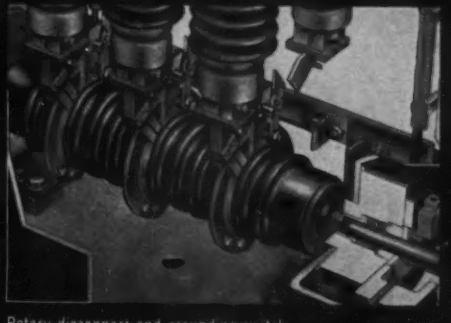
Space-Miser Transformers service-proved

have been in 42 Network Systems



Contoured tank, Yukon coolers

Superior design bushings



Rotary disconnect and grounding switch

This SPACE-MISER being installed in the network system of Georgia Power Company assures this progressive utility of improved network reliability.

Here is the *sure* way to improve network reliability: put SPACE-MISER transformers in your network vaults. Since the SPACE-MISER was introduced two years ago, its reliability has been thoroughly proved in 42 network operations throughout the country.

This reliability is inherent in the SPACE-MISER design. Here are some of the outstanding SPACE-MISER features that will help you improve your network reliability:

CONTOURED TANK AND YUKON COOLERS—The SPACE-MISER design eliminates sharp corners and allows a uniform finish to be applied for better corrosion protection. This extends the period between scheduled inspection and maintenance on coolers.

SUPERIOR DESIGN BUSHINGS—Rolled-flange gasketed bushings with retained gaskets and metal-to-metal stops are standard equipment. Similarly constructed low-voltage bushings with inert-arc weld seal can be supplied. Use of either of these bushings eliminates shutdowns for bushing maintenance.

ROTARY DISCONNECT AND GROUNDING SWITCH—The one-piece porcelain cylinder with babbitted-in contacts is keyed to a full-length stainless steel shaft. Metal-to-metal stops for the retaining rings in the shaft seal assure that the correct pressure is applied to the silicone-rubber bushing.

OVERLOAD CAPACITY—Overload capacity has been maintained in the SPACE-MISER. This assures reliability to meet emergency overload conditions.

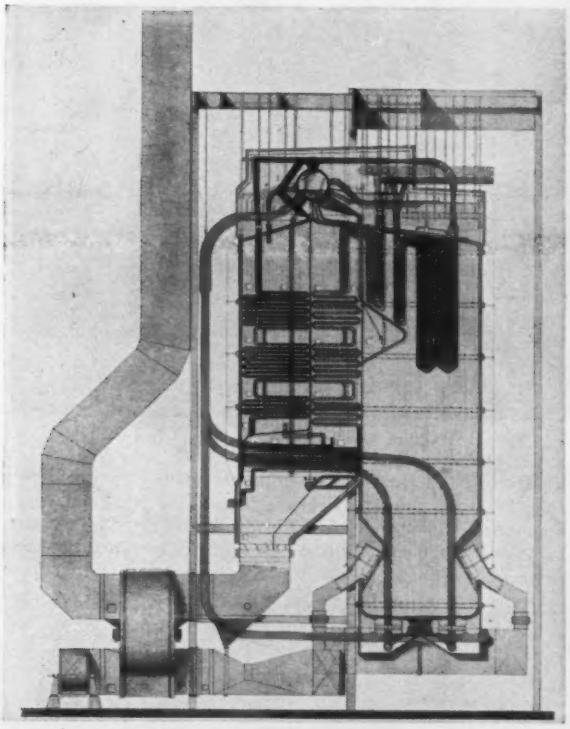
In addition to these excellent reliability features, the SPACE-MISER transformer is 20 per cent smaller. This makes installation and change-out easier and faster, gives extra space in existing vaults or permits new vaults to be built smaller.

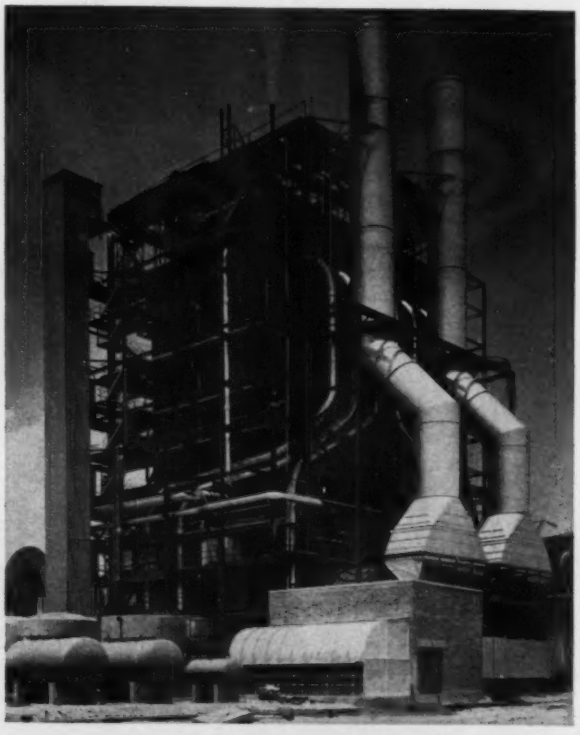
The SPACE-MISER is another example of how Plowback of Earnings into research and development at Westinghouse is bringing the electric utilities big benefits—in tomorrow's apparatus, and today's. For further information on how the SPACE-MISER transformer improves network reliability, call your nearest Westinghouse representative or write Westinghouse Electric Corp., P.O. Box 868, Pittsburgh 30, Pa.

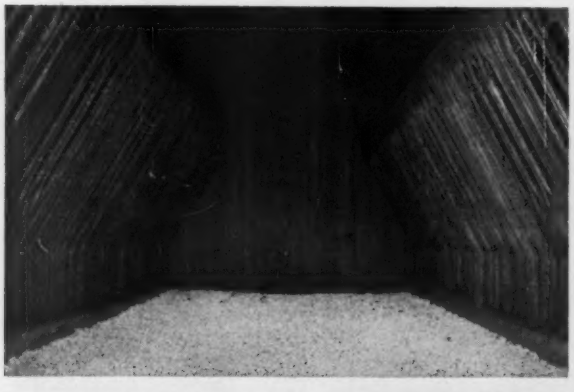
J-70888

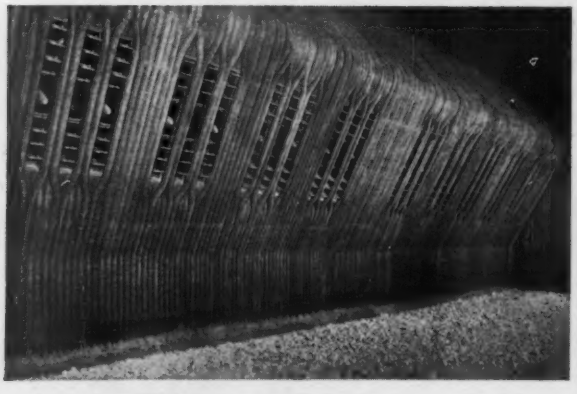
YOU CAN BE SURE...IF IT'S **Westinghouse**

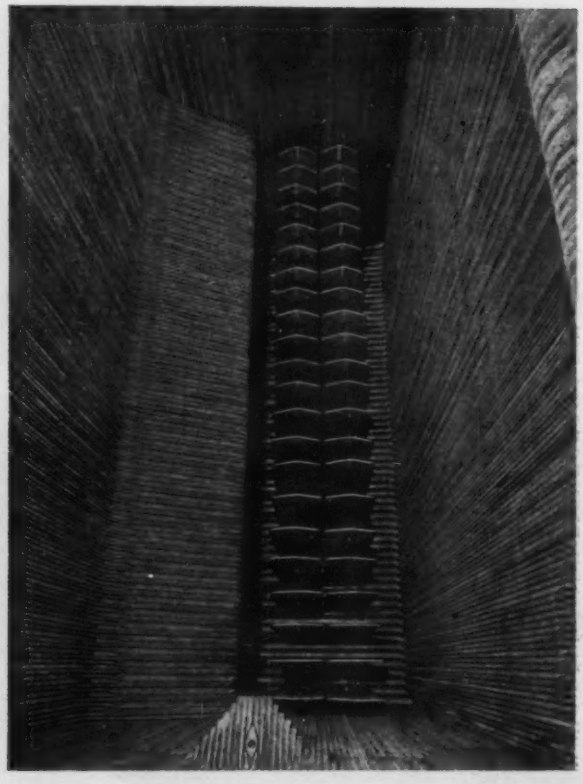
Performance









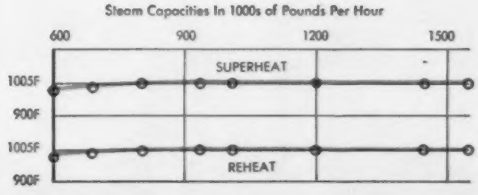


# of RILEY TURBO FURNACE Reheat Unit At Sterlington Steam Electric Station

Exceptional From Start-Up!

Unit Capacity — 1,550,000 lbs/hr
Pressure — 2175 Psig
Superheat and Reheat — 1005F

Wide Range of Steam Temperature Control

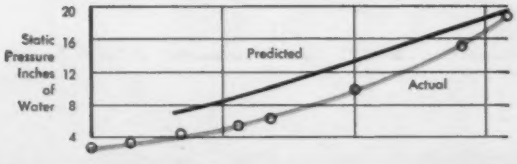


Low Air Heater Exit Gas Temperature

High Unit Efficiency

Low Forced Draft Fan Pressures

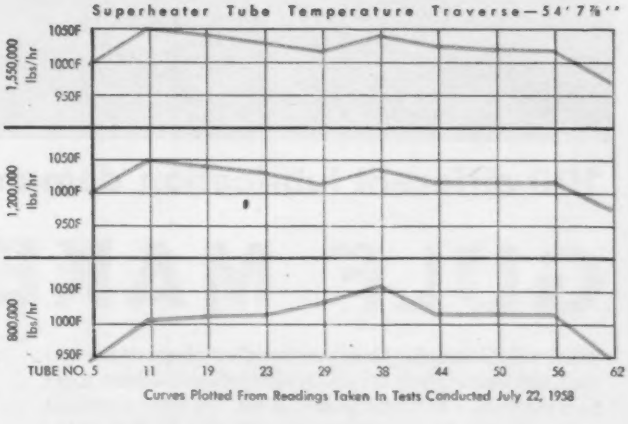
Low Auxiliary Power



Minimum Superheater Metal Temperature Variations Across 54 Ft. Wide Furnace

This results from the fact that the Riley Directional Flame Burners, arranged for opposed firing, produce uniform combustion across the entire 54' 7⅞" width of this Turbo Furnace which has no water cooled platens or divided walls. Gases rise evenly and vertically within the furnace envelope.

Views of Louisiana Power & Light Company's Riley Unit at Sterington illustrate the characteristic TURBO FURNACE bottom and some of the 20 Directional Flame Burners.

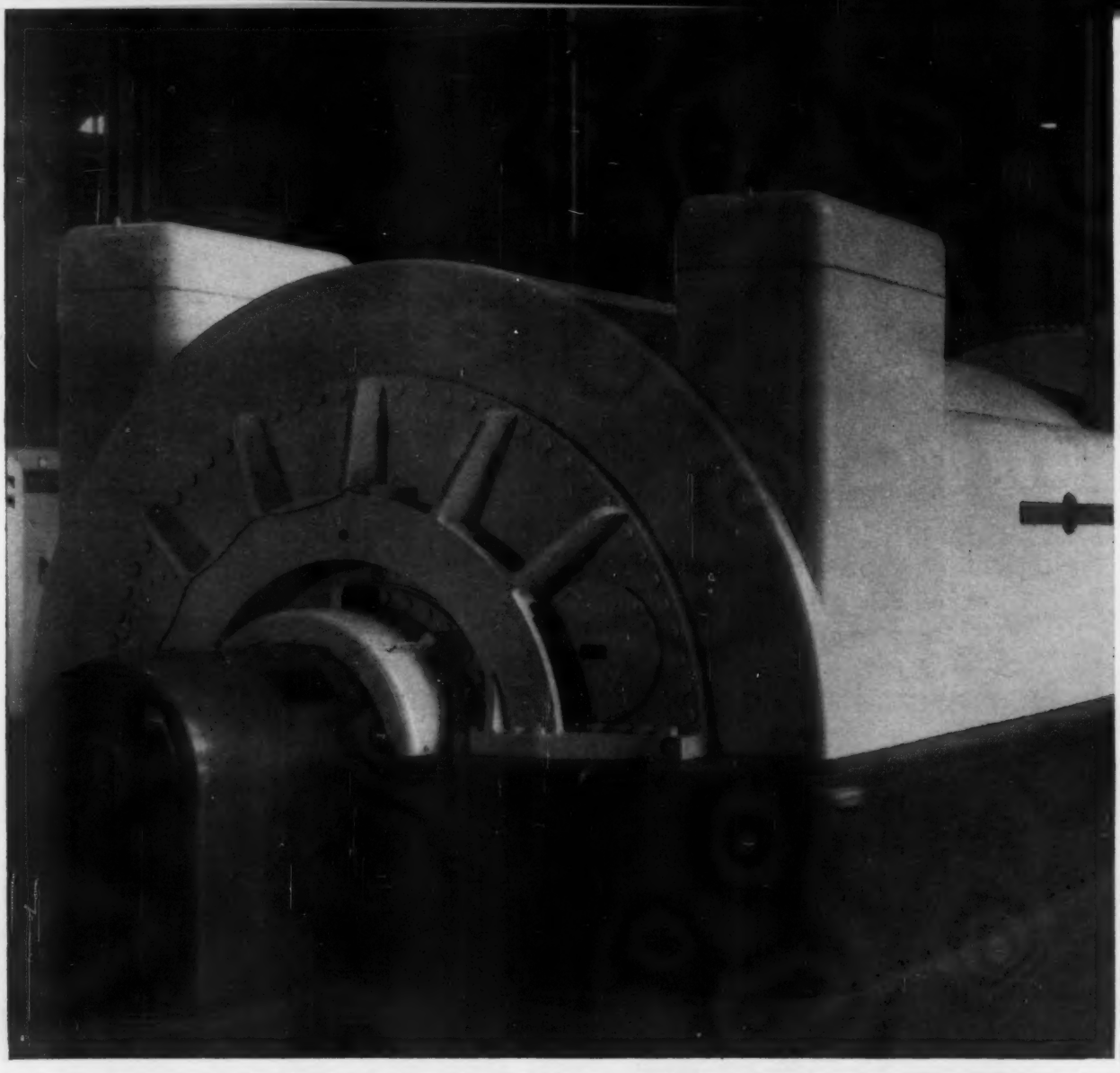


Curves Plotted From Readings Taken In Tests Conducted July 22, 1958

FOR TURBO FURNACE DETAILS — WRITE RILEY STOKER CORPORATION, WORCESTER, MASSACHUSETTS

A survey of your plant by a qualified consulting engineer could show ways of making surprising savings in your power costs.

RILEY
STEAM GENERATING & FUEL BURNING EQUIPMENT



100 different lubrication demands met by 4 oils, 4 greases at

GULF MAKES THINGS

What would you do? Over one hundred pieces of equipment for a new plant . . . and specifications indicate that each requires a different grease or oil.

The Tampa Electric Company called on Gulf to help solve this problem—in Florida's newest generating plant —the Francis J. Gannon Station in Tampa.

Gulf Engineers moved in before plant operation began in August 1957. They ran exhaustive tests and analyses to simplify this complex lubrication problem.

Result? The entire station—from soot blowers to turbines—now uses only 4 oils and 4 greases . . . Gulf oils and greases that prove Gulf makes things run better.

Tampa Electric chose Gulfcrest 44 to lubricate its new 130,000 kw General Electric generator—the first of six units of similar capacity for this station.

To check the performance of this generator, Tampa Electric takes hourly readings of steam temperature and pressure, and runs laboratory tests on samples of the turbine oil every 30 days. "There is no foaming, sludge formation, or rust, and most important, neutralization numbers remain remarkably constant," reports Barney Sheppard, assistant chief engineer.

Gulf works closely with Tampa Electric. Checking operations at the new Francis J. Gannon Station are Barney Sheppard, left, assistant chief engineer of the plant, and C. L. Thomas, Gulf Sales Engineer.

Proof in the lab. Every 30 days Tampa Electric runs laboratory tests on used Gulfcrest Turbine Oil. Neutralization numbers remain consistently low.

Running smoothly on Gulfcrest 44, this is one of the new 130,000 kw turbine generators at Tampa Electric Company—where Gulf service and products are used exclusively.

Tampa Electric . . . more proof that

RUN BETTER!

Gulfcrest helps keep turbine systems clean

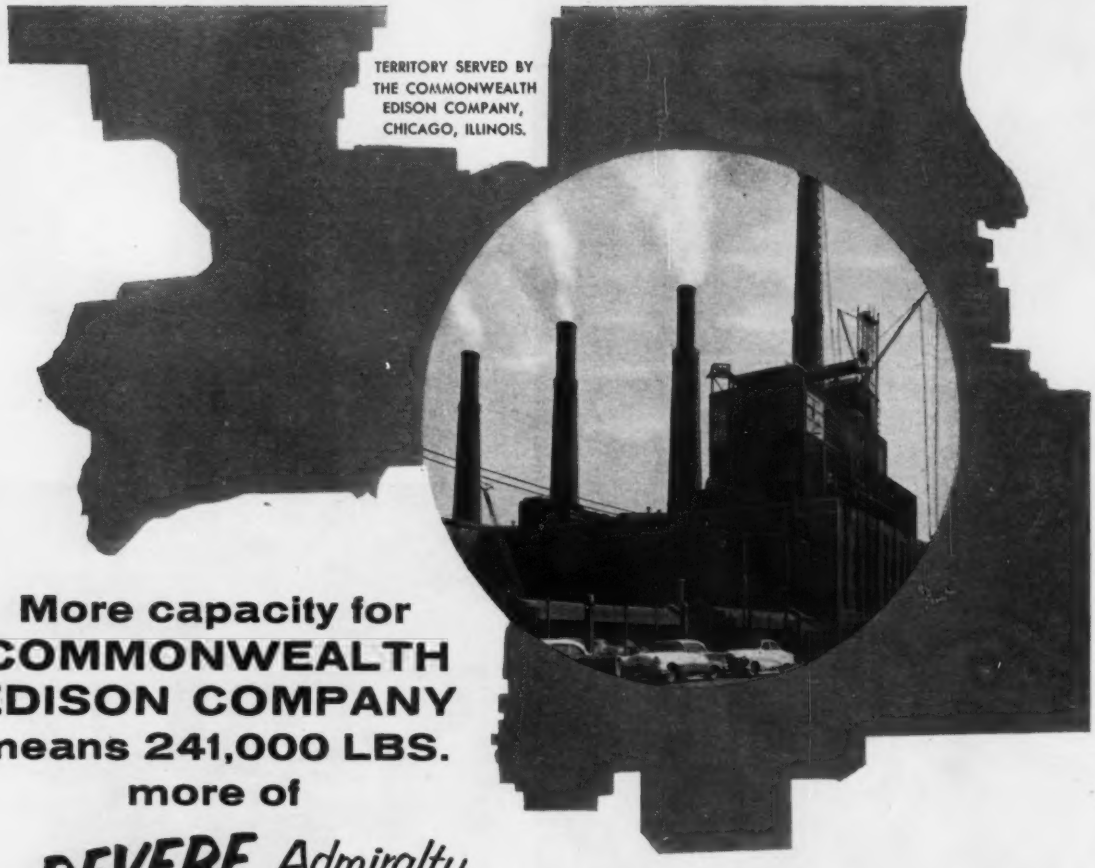
Many of the country's prominent utilities have used Gulfcrest in their turbines for 15 to 20 years. These systems are still free from sludge and rust. What's more, records in the Gulf market area show . . . more power is generated by central station steam turbines lubricated with Gulfcrest than with any other turbine oil.

Simplify your lubricating problems and improve performance. Use Gulf Petro-engineering service. 1,300 Gulf scientists and technicians are ready to assist you.

Get the facts from your Gulf Sales Engineer. Just call your nearest Gulf office, or write for new illustrated Gulfcrest booklet.

GULF OIL CORPORATION
Dept. DM, Gulf Building
Pittsburgh 30, Pa.

GULF



More capacity for COMMONWEALTH EDISON COMPANY means 241,000 LBS. more of

... REVERE *Admiralty* CONDENSER TUBES

Unit #7, at Crawford Station, Chicago, 205,000 kw, is now in operation. This new unit is the first step in the modernization program of Crawford Station and a major item in the huge expansion program scheduled by the Commonwealth Edison Company. Covering a four-year period at an estimated cost of $600,000,000, the program will effect operating economies, increased efficiency and improved customer service, boosting the generating capacity of the Commonwealth Edison Company System to about 5,500,000 kw by the end of 1961.

The use of Revere Condenser Tubes for the important Crawford Unit we consider to be a tribute to the quality of the tubes produced by the Revere Mills.

Of equal importance to condenser tube quality is the selection of the alloy. In this respect, power engineers have found it advantageous to consult with Revere's Technical Advisory Service. The long and varied experience of the Technical Advisors who render this service makes them qualified to help in the selection of the alloy best suited to the specific set of operating conditions encountered in your present power plant or a proposed unit. This experience, which has covered many and diversified types of problems, has been instrumental in prolonging tube and plate life for power plants large and small.

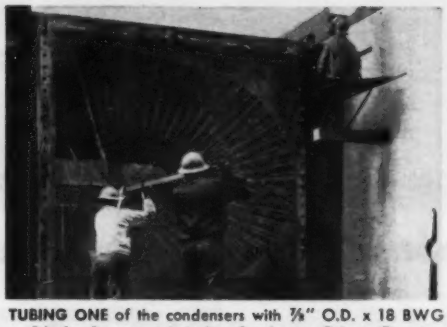
Why not take advantage of this storehouse of knowledge and contact Revere before making your final selection?

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

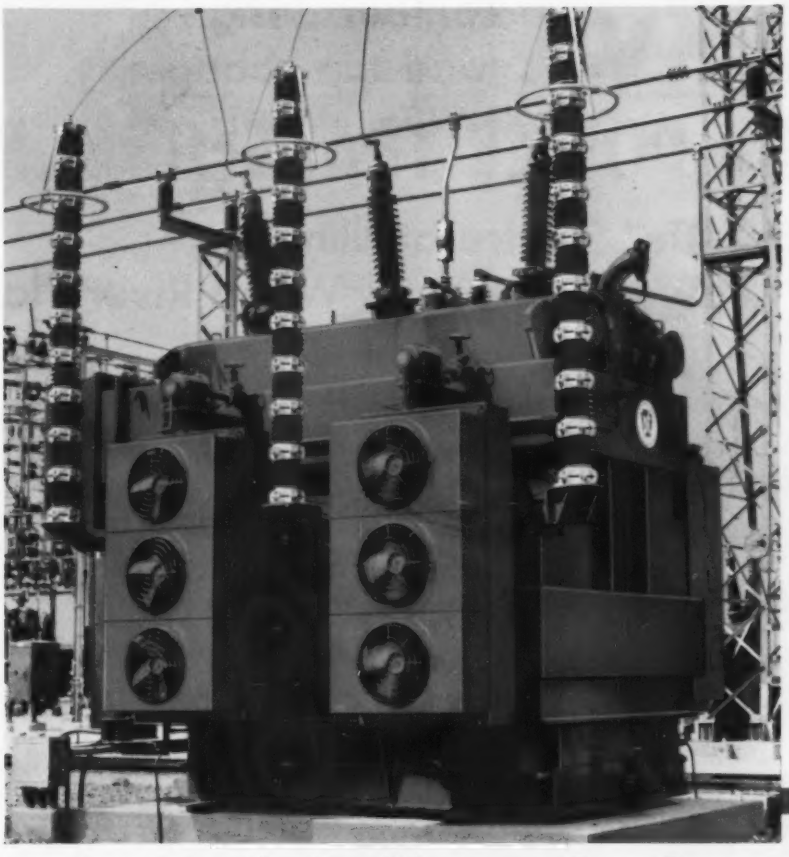
230 Park Avenue, New York 17, N. Y.

Mills: Rome, N. Y.; Baltimore, Md.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Brooklyn, N. Y., Newport, Ark.; Ft. Calhoun, Neb. Sales Offices in Principal Cities, Distributors Everywhere.

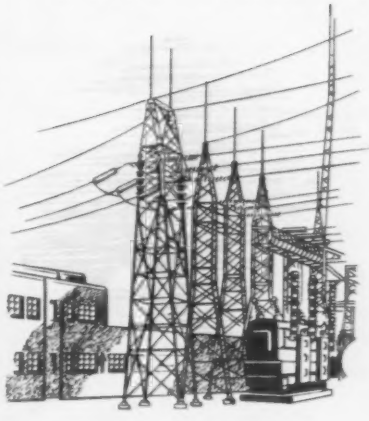


TUBING ONE of the condensers with ⅞" O.D. x 18 BWG x 36 ft. Revere Admiralty Condenser Tubes. The two condensers required 241,000 lbs. of tubes.

VIEW SHOWING the two new condensers on either side of the turbine which will be fed by a single boiler. This replaces the two turbine generators and six boilers installed in 1924-25, which required nearly twice as much coal as the new unit to produce a kwh of electricity.



AT WOOD RIVER POWER STATION



At Wood River Power Station in Illinois, a 100,000-kva Pennsylvania LTC Transformer connects 138-kv and 34.5-kv buses to permit interchange of capacity between the two buses.

To Apportion the Load between Two Generators...

ILLINOIS POWER COMPANY CHOSE A 100,000 Kva LTC Transformer by PENNSYLVANIA

The total capacity of Illinois Power Company's Wood River Plant is 250,000 kw, of which 150,000 kw is connected to a 138-kv bus and 100,000 kw is connected to a 34.5-kv bus. By interconnecting these two buses with a 100,000-kva Pennsylvania LTC Power Transformer, Illinois Power is able to apportion the load between them to permit the greatest possible efficiency and economy of operation.

There are times (particularly during maintenance periods) when the load on the 34.5-kv bus is greater than the generating capacity at that voltage. When this occurs, part of the load is carried by the transformer, which in effect "transfers" it to the 138-kv bus. Conversely, there are other times (such as minimum load periods) when the load on the 34.5-kv bus is *less* than capacity and the transformer delivers this excess to the 138-kv bus.

The transformer—which features Pennsylvania's space-saving, weight-saving, shell-form Contour Design—has load tap changing equipment for plus or minus 10% regulation in 32 steps of $\frac{5}{8}\%$. The exceptionally quiet and efficient operation of this high-capacity LTC equipment is one of many reasons why leading utilities so often choose Pennsylvania. Contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

McGRAW EDISON

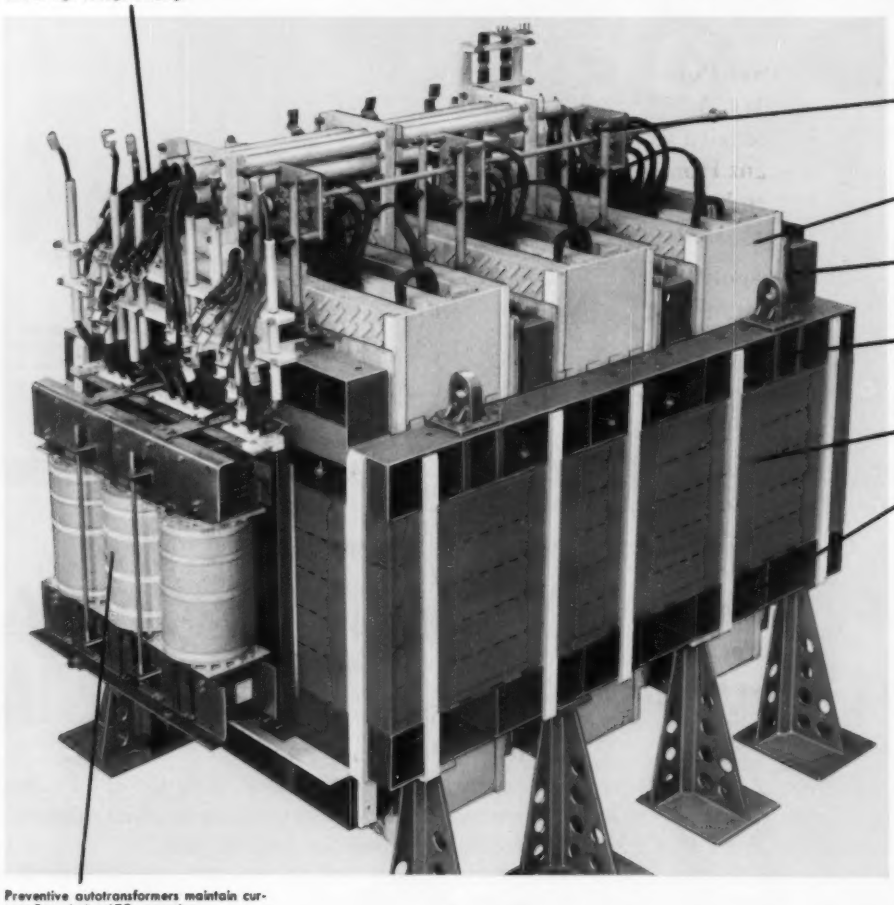
PENNSYLVANIA TRANSFORMERS

PENNSYLVANIA POWER TRANSFORMERS

See next page for design details

100,000 Kva contour design load tap changing PENNSYLVANIA POWER TRANSFORMER

In "Bus-Tie" Service at Illinois Power Company's Wood River Plant


Tap leads for LTC equipment in neutral end of high voltage winding.
High voltage manual tap changer is accessible through manholes for inspection and maintenance.
Vertical cooling ducts in coils permit free flow of oil through coils for most efficient cooling.
Heavy box sections form part of core frame and clamp coils to protect against short circuit forces.
Core and coils clamped together with heavy steel frames. Core-and-coil unit can be handled separately as complete sub-assembly.
Core cooled by both vertical and horizontal ducts.
Core-and-coil assembly rests on bottom section of Contour Design tank.
Preventive autotransformers maintain current flow during LTC operation.

100,000 Kva, three phase, 60 cycles, 55° C. temperature rise. Forced-oil, forced-air-cooled. High voltage: 132,000 Grd.Y volts with two 2½% taps above and below normal and LTC equipment for ± 10% regulation in 32 steps of ⅝%. Low voltage: 34,500 Δ volts. Shell-form Contour Design.

Pennsylvania has the *Facilities* and the *Capability* to meet the Largest Power Transformer Requirements...

- A large, expertly-staffed engineering department with long experience in power transformer design—both core form and shell form.
- The ability to design and construct scale models for proving design characteristics.
- A modernly equipped plant capable of producing and testing the highest rated units contemplated by industry today.
- Handling and loading facilities that permit full utilization of manufacturing, shipping and installation economies.

McGRAW EDISON

PENNSYLVANIA pt TRANSFORMERS

PENNSYLVANIA TRANSFORMER DIVISION

McGraw-Edison Company

CANONSBURG, PENNSYLVANIA Greater Pittsburgh District

See other side for installation view . . .

The Electrical Week

FUTURE NEWS ▶ **Comptroller General Joseph Campbell will release a letter** soon to Agriculture Secretary Ezra Benson on the issue of REA loans being used to build power facilities in areas where private ones already exist.

LATE NEWS ▶ **At World Power Conference in Montreal . . .**

- Russia's A. S. Pavlenko succeeds U.S. delegate G. A. Hathaway as vice chairman.
- Franz Holz of Austria remains as conference president.
- Membership applications from both Chinas are turned down, but Peru, Rhodesia, Nyasaland and Uganda are admitted.

Indianapolis P&L dedicates $134 million Elmer W. Stout Station, named after the man with the longest service record as a director.

Russian delegates will visit U.S. hydro dams in three separate tours, says W. A. Dexheimer of Bureau of Reclamation. Arrangements for Americans to visit Russian dams are in the offing.

FPC report says U.S. has about 90.6 million kw of potential hydro. Of this undeveloped potential, 50.1 million kw lies west of Continental Divide; 31.6 million in the Columbia River Basin alone.

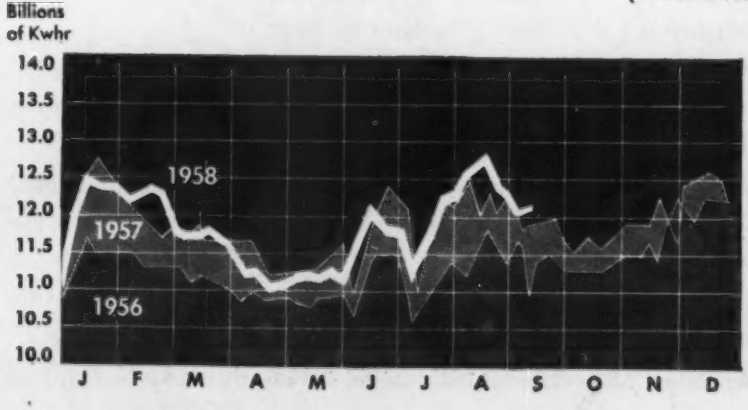
Westinghouse announces reduction in transformer noise levels from nine to one db, with no increase in size or price.

Jersey Central offers to buy Tri-County Rural Electric Co. Letter from JCP&L President C. E. Kohlhepp was accompanied by a $917,000 certified check.

Management changes . . . PS of Indiana elects following vp's: J. R. Dunigan, E. M. Gue, R. C. Pattyn. V. R. Renstrom becomes comptroller.

POWER OUTPUT—UP 2.5%

(Week ending Sept. 13), Kwhr 12,248,000,000



Per Cent Change From Previous Year

	Aug. 30	Sept. 6	Sept. 13
Total U.S.	+1.0	+3.0	+2.5
New Eng.	+4.9	+3.4	+2.4
Mid. Atlantic ..	+3.4	+1.0	−1.8
Cent. Ind. ...	−1.3	+3.5	+2.2
West Cent. ...	−0.6	+4.9	+7.7
Southeast	+2.3	+0.6	+1.0
South Cent. ...	−1.0	+8.8	+14.4
Rocky Mount...	+7.8	+9.8	+9.0
Pacific			
NW	−8.3	−4.9	−4.1
SW	+6.1	+5.3	+1.2

Seasonally Adjusted Index 235.2

Week Ago 235.9 Year Ago 229 0

Source: Edison Electric Institute

EVENTS ▶ **The FPC has deferred its decision indefinitely** on a proposed contract under which Consolidated Edison would buy up to 50 million cu ft of natural gas daily for use in the Waterside No. 2 generating plant. Under the proposal, Con Ed would buy the gas from Texas producers, and Transcontinental Gas Pipe Line Corp would transport it at an additional charge **(p 94).**

A new list of demands it will make on Congress has been outlined by National Rural Electric Cooperative Assn. Among the many:

- Establishment of public power districts.
- Enactment of laws for Federal transmission grids.
- Establish enough federal A-plants to determine costs.

AIEE MEETING ▶ **A new zig-zag high voltage ring bus design was introduced** to the industry at the Pacific General Meeting of American Institute of Electrical Engineers at Sacramento, Calif. The zig-zag, which Sacramento Municipal Utility District will use for 230 and 115-v rings at its new Hedge Substation, was one of the interesting developments at the meeting. AIEE President L. F. Hickernell also outlined Society's 75th Anniversary plans **(p 97).**

GENERATION ▶ **Broken turbine valve studs may be removed safely** by using a guide bushing and a 5/8 x 16-in. long drill. The stud is taken out without damaging the valve pressure seal head. It also obviates sending the head back to the factory to be repaired **(p 98).**

METERING ▶ **Meter testing a problem?** Read how Philadelphia Electric cut testing costs 30% by borrowing a few production line techniques. The handling problem is solved with a conveyor system that takes care of 600 meters a day, and can be modified to accommodate 1,000 **(p 98).**

DISTRIBUTION ▶ **A quickly built, durable, inexpensive garage for trucks** can be yours for a few poles from stock and some corrugated iron. See how Consumers Power did it on page **99.**

SPECIAL REPORT: FORECAST ▶ **Highlights of EW's 1958-75 Forecast on page 101:**

- **Total construction expenditures** will fall 8.6% in '59 from this year's record high of $5.2 billion, but the decline will not be across the board.

- **Generation and transmission** will get the most severe trimming. Generation spending will be down 17%, while transmission expenditures will be almost 10% under 1958's high of $805 million.

- **Distribution spending** will climb 6.8% next year. Reason: Continued growth of residential and commercial sales.

- **December '58 peak loads** will hit about 114 million kw, 7.1 million

more than in 1957. The '59 peak load gain will be 12.1 million kw.

• **A new capacity record** of 15.3 million kw in 1958 will boost generation capability to 145.9 million kw and raise '58 reserve capacity margin to 28%, but . . .

• **By 1961 growing peak loads** and a lower rate of capacity additions will whittle margin to 21.5%. Then . . .

• **Capacity margins will bounce back up** to 13.2 million kw in 1962 after dipping to 9.6 million kw in '61.

• **Despite a recession-ridden economy** in the first half of the year, 1958 energy sales will inch up 1.8% to 568 billion kwhr. A revitalized economy should spark a 9.5% gain in 1959.

MANUFACTURERS ▶ **Pennsylvania Transformer Division, McGraw-Edison, reduces** prices on load tap changing transformers in ratings 10,000 kva and smaller, 69 kv and below, effective Sept. 15 **(p 122)** . . . **Allis-Chalmers'** 180,000-sq ft condenser goes into operation at Waukegan, Ill., station of Commonwealth Edison Co **(p 122)** . . . Anaconda-Jurden Associates is formed as engineering subsidiary of Anaconda Co, with Wilbur Jurden as president **(p 124).**

NEW EQUIPMENT ▶ **Demand meter test table** provides proper loading for one demand and one reference meter. It can be used to test either bottom terminal (A) type single and polyphase meters or socket (S) type single-phase meters . . . Load break lever can be attached to any Faultmaster cutout in minutes . . . Suspension insulators rated 25,000 lb have grey glaze so user can distinguish them at a glance from 15,000-lb mahogany colored units **(p 134).**

SELLING ▶ **Electric utilities are lining up** solidly behind the "Farm Better Electrically" program. Read the roundup story of how five companies are helping their farm customers toward more profits and an easier way of life on page **152.**

BUSINESS OUTLOOK ▶ **Signs point to less inflation ahead—not more** as many people fear. The "cost-push" will see to it that prices go up about 1-2% a year, but that's less than half the rate we've had since World War II. Inflation-slowing factors: Large manufacturing capacity reserve; a more ample labor supply; and a strong anti-inflationary policy by the Federal Reserve authorities **(p 161).**

PEOPLE ▶ **New Pennsylvania Electric president is L. H. Roddis, Jr,** succeeding O. Titus, who becomes board chairman . . . C. D. Manhart is vp, government relations at Raytheon . . . New England Electric System elects H. G. Lassele as vp and general purchasing agent . . . Harry Restofski, retired West Penn vp, to take on new role as magazine publisher **(p 167).**

Joint effort may bring relief to the right-of-way problem. The teamwork approach could include a public information program; R/W school courses; development of model zoning laws; inclusion in the rate base of land held for future use; and combination of services on fee-owned R/W strips.—**M. C. Westrate, Public Utilities Fortnightly, July 17, 1958**

TECHNICAL NOTES

Ultrasonic cleaning of minute precision relays has resulted in improved performance at lower costs. Relays are used in aircraft and missiles.

Network analyzer studies of transmission transient stability agree very closely with actual tests of this nature performed on the British 132-kv grid. Flux decay, even with voltage regulators, is a factor which alone could result in the small discrepancies between the studies and the actual performance tests according to the British report.

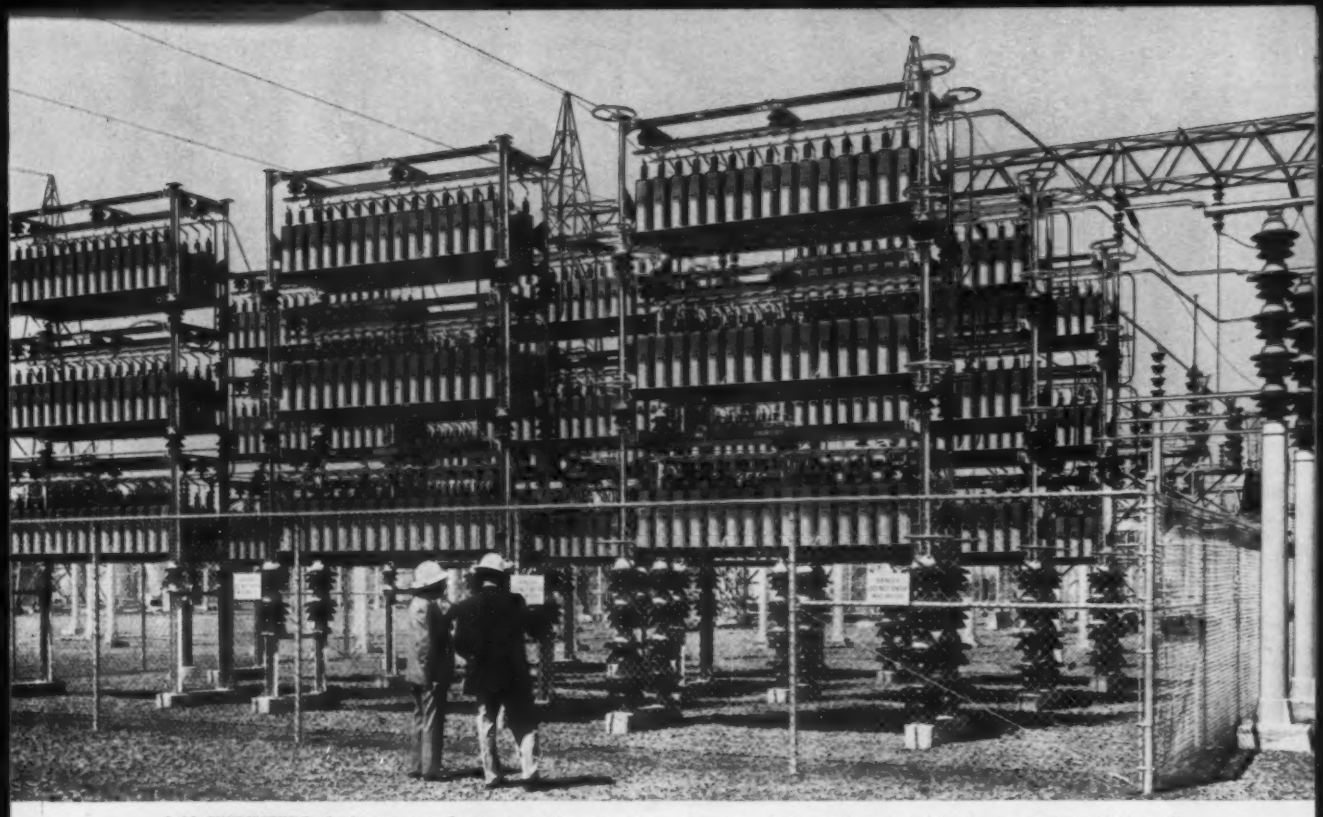
Error data of meters indicate that the number of meters not meeting acceptable limits is appreciably less when based on total energy measurements rather than on conventional as-found accuracy checks.

Some 4.4 cubic centimeters of gases are produced when only 1% of the atoms in one cc of U-235 fissions. The rare gases produced are practically insoluable in uranium so that they are held under very high pressure within the solid fuel lattice structure. This accounts for the detrimental swelling of atomic fuel rods.

Aluminum sheath for underground use must be covered with an adequate protective jacket to prevent corrosion.

FROM EDITORS IN THE FIELD

Each protective device which initiates closure of fuel shutoff valves will be provided in duplicate according to present boiler tripping practices of Oklahoma Gas & Electric Co. Both devices must operate to trip the valve. Actual tripping device is also duplicated, but operation of either will cause the shutoff valve to close.



L-M ENGINEERS design many large capacitor banks, such as this 40,500 kvar, 230 kv switched bank, said to be the highest voltage shunt capacitor bank in the country. It is made up of L-M factory-assembled and wired blocks of 50 kvar Elemex capacitors, such as the one shown below.

L-M Designs Capacitor Installations From 240 Volts To This 230 kv Bank

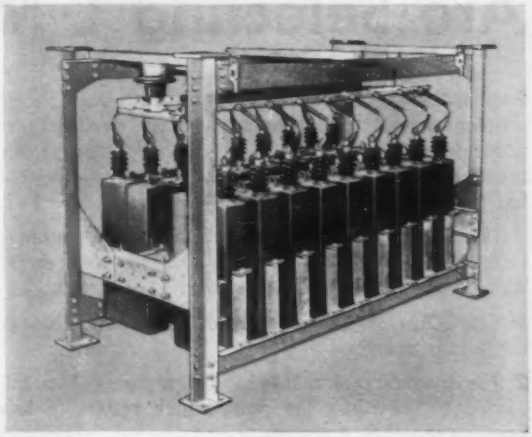
The bank shown above (location on request) consists of twenty-seven 1500-kvar split-bus capacitor blocks. Each block contains thirty 50-kvar 7200-volt single-bushing Elemex capacitors; each individually fused, in two series groups.

Each phase contains eighteen series groups in nine blocks for a voltage of 129,600 per phase to neutral.

Since the neutral is solidly grounded, graded base insulation is used—196 kv porcelain under the incoming line stack; 69 kv under the middle stack; and 15 kv under the third stack. Notice also the corona rings on all blocks of the incoming line stacks at the right.

Let L-M Engineer YOUR Banks

Call on the L-M Field Engineer for anything from a 3 kvar secondary capacitor to the largest bank. He can provide literature, and tell you how to get L-M application engineering service. Or write Line Material Industries, Milwaukee 1, Wisconsin.



TYPICAL L-M BLOCK OF Elemex capacitors. Block is assembled and wired at the factory, ready to install. L-M was the first with 50 kvar capacitors and a leader in the engineering of pre-wired blocks and pole-type racks, which can be supplied with or without oil switches mounted on the rack.

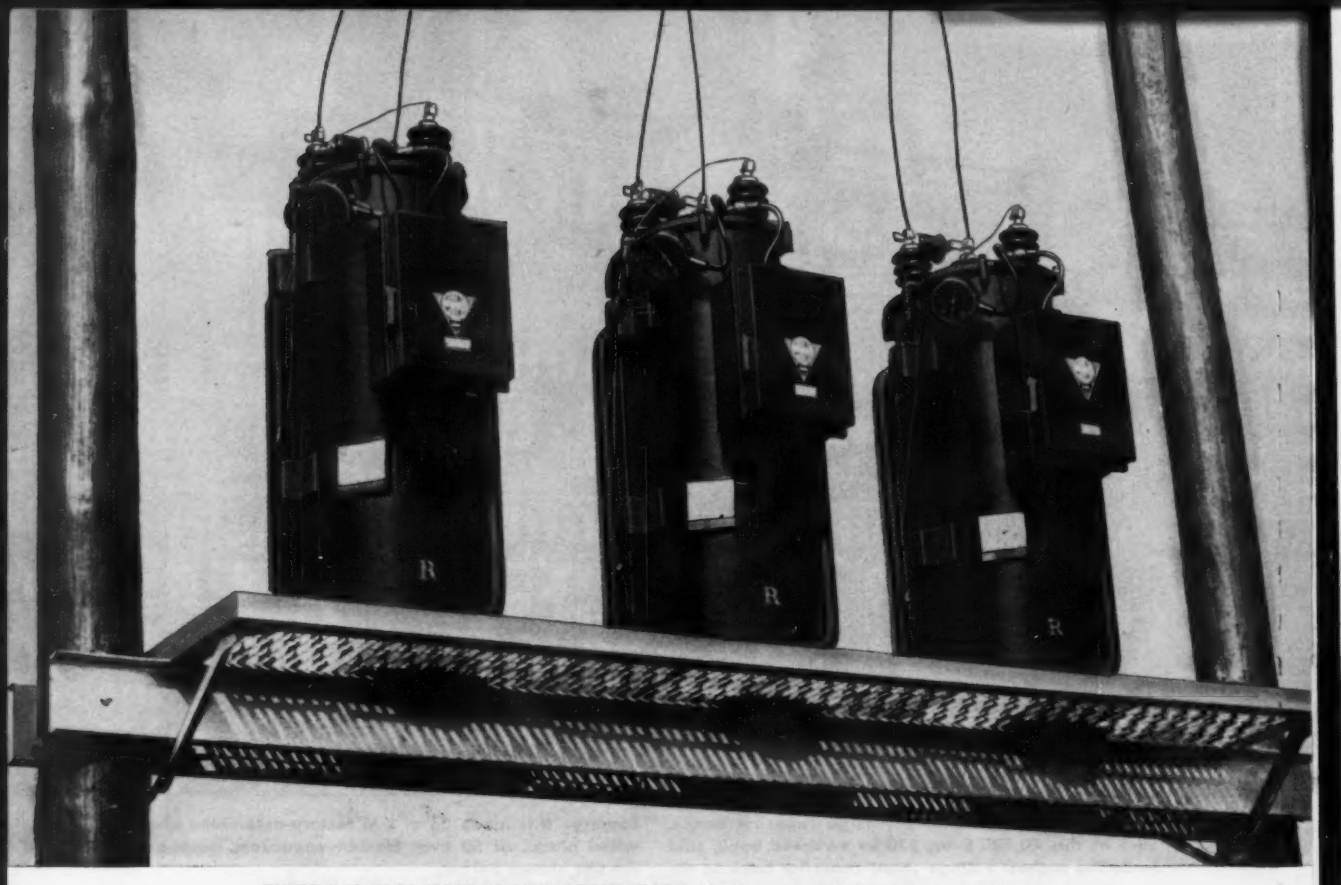
364

LINE MATERIAL Industries *Elemex® Capacitors*

McGRAW-EDISON COMPANY

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

McGRAW EDISON



THREE L-M 7620 VOLT 32-STEP REGULATORS, platform mounted, are in a circuit serving cotton gins and other customers where accurate regulation is a necessity.

6 Reasons More and More Utilities Are Selecting L-M Step Regulators

Pole-space saving, obround tank with less bending moment, cover suspension, tap changer, easily adjusted accurate control, and Add-Amp feature are some of the reasons why utilities throughout the country are selecting L-M regulators.

The L-M 32-step regulator includes the desirable features of all distribution-type regulators in one complete unit. Several of these features are:

1 The L-M regulator, because of its short height, takes less pole space.

2 The obround tank makes L-M regulators lighter, more compact. They hug the pole, which results in lower bending moment.

3 Cover suspension of the entire internal assembly facilitates inspection and maintenance.

4 The unusually rugged tap changer, with hydraulic speed control for optimum contact life, provides regulation in smooth $\frac{5}{8}\%$ steps.

5 The L-M Add-Amp feature gives increased load-carrying ability where less than $\pm 10\%$ range of regulation is satisfactory.

6 The control, with induction disc type contact-making voltmeter and Class I accuracy, has simple adjustments for voltage level, band width and line drop compensation. Taps can be changed on ratio correcting transformer in control cabinet, for reduced voltage operation, *without* untanking of regulator.

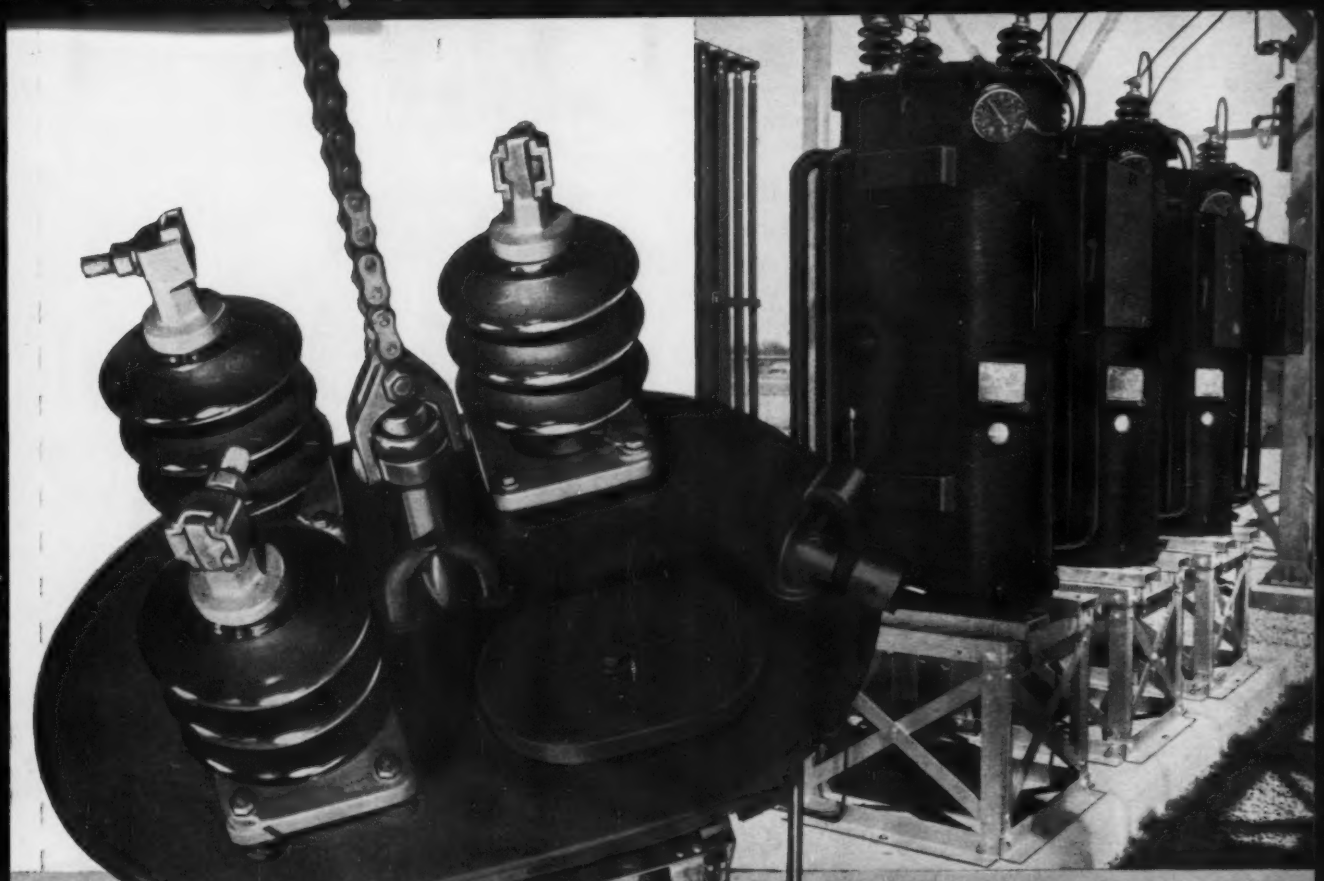
Many other features combine to make this a most desirable regulator, which many utility men consider superior to anything else on the market. No other regulator offers so many advantages in one single unit.

Ask the L-M Field Engineer About It

The L-M Field Engineer can provide complete information and bulletin on the application and design of L-M regulators. Or write for bulletin to Line Material Industries, Milwaukee 1, Wisconsin.

LINE MATERIAL Industries

McGRAW-EDISON COMPANY



A SUBSTATION INSTALLATION of three 7620 volt regulators. L-M regulators are presently available in these ratings: 2.5 kv, 100, 150, 200 amps; 5 kv, 50, 100, 150, 200 amps; 7.62 kv, 25, 50, 75, 100, 150 amps.

THE COMPLETE INTERNAL ASSEMBLY is cover-suspended to simplify untanking. This desirable feature permits quick, easy inspection of all mechanical and electrical parts, without dismantling the unit or draining the oil.

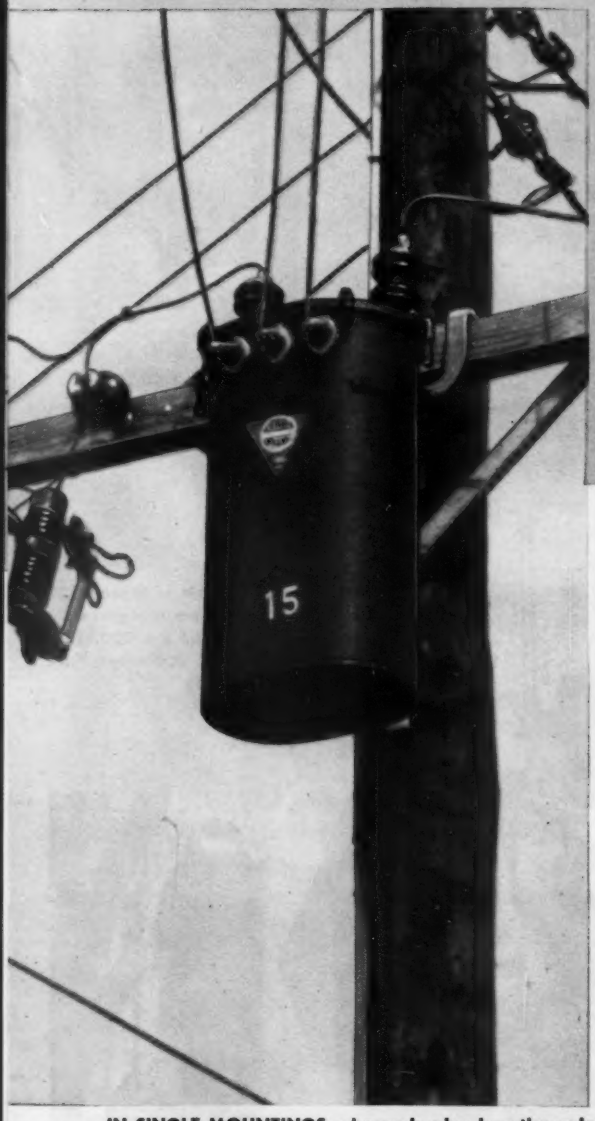
THE L-M REGULATOR is light, small, compact. This and the obround tank make the L-M regulator very desirable for pole mounting, because of the reduced bending moment on the pole. The L-M regulator is as much as 21 inches shorter than other regulators; thus it takes less pole space.

Regulators

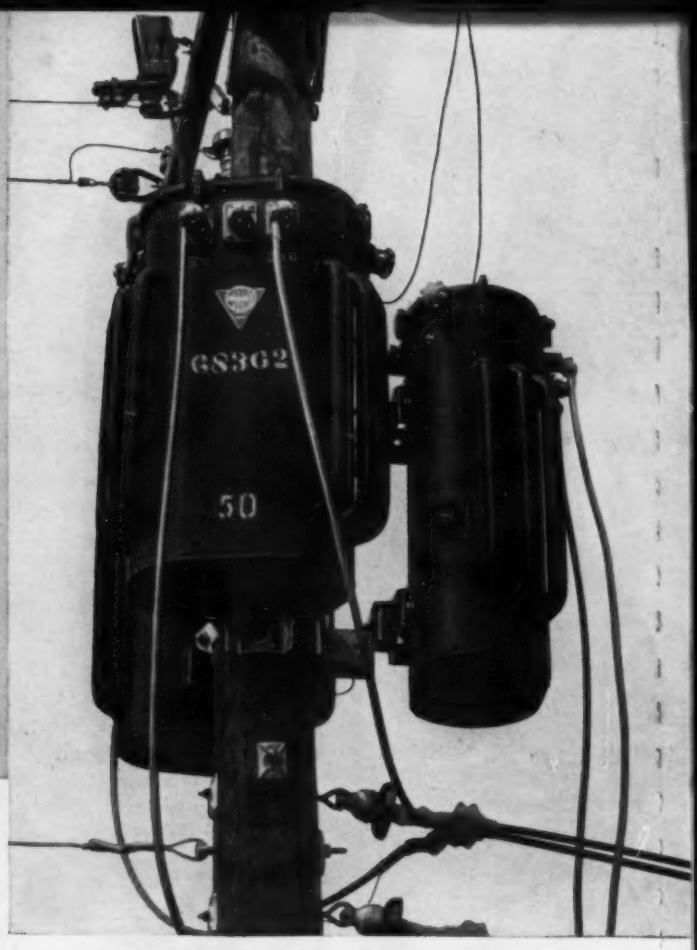
McGRAW EDISON

361

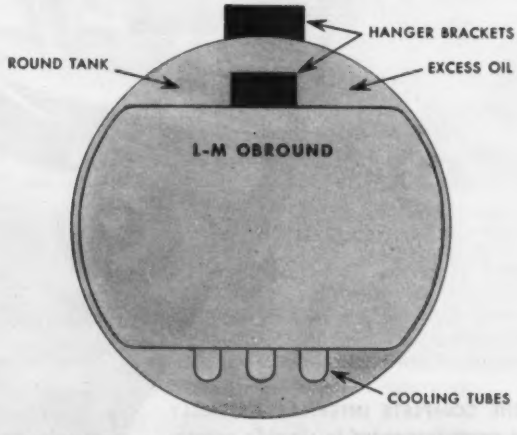
DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT



IN SINGLE MOUNTINGS, obrounds also hug the pole, cutting bending moment and providing a very neat-looking installation, as shown in this photo of an L-M Round-Wound transformer on the lines of Public Service Company of Indiana, Inc., in a new subdivision north of Plainfield.



ANOTHER VIEW of the obround cluster-mounting, showing the accessibility of bushings and convenient arrangement for the linemen. These obround transformers may be hung on any standard cluster-mounting bracket, and spacing may be adjusted as desired.



DRAWING shows the difference in size and shape between a standard round tank and the L-M obround transformer. The obround has less oil, and tubes provide ample cooling. The lighter, more compact obround hugs the pole, reducing bending moment on the pole.

PHOTOS BY
A. T. BELLER

LINE MATERIAL Industries

McGRAW-EDISON COMPANY

THREE CLUSTER-MOUNTED 50 kva 2400 volt L-M obround transformers serving a large hospital at Lafayette, on the Public Service Company of Indiana, Inc., system. The neat appearance and the convenience for linemen which the L-M obround shape offers, and the economy, performance, and long life of the L-M-exclusive Round-Wound construction are ideal for this type of installation.

Public Service Company of Indiana, Inc., Likes Neat Appearance of L-M "Obrounds"

Compactness and light weight make obround transformers easier to hang, provide more climbing space, improve pole appearance, and give highly efficient performance.

Hundreds of utility men have selected L-M obround transformers because of their compact shape, and because the performance of the L-M-exclusive Round-Wound® design is still outstanding in load capacity and economical operation.

Public Service Company of Indiana, Inc., has installed a sizable number of L-M obround transformers, in both cluster and single mountings. Among the many desirable features found in the obround design were its neat appearance, the fact that it provides ample, safe climbing space, and the good acceptance of this transformer by the linemen.

In cluster mountings, the use of the obround offers a substantial saving in material and labor over a standard two-pole platform installation. Wiring costs are substantially lower, particularly on the 167 kva units.

"In fact," one company engineer stated, "with the obround we can practically put a whole substation on one pole! This is particularly advantageous in temporary locations such as those in the Indiana Limestone quarrying areas, where stations must be moved to serve moving quarry operations."

The obround transformer goes up easily between secondary wires. In working on a single transformer or a cluster, the lineman has ample working space, and he doesn't need to extend his safety belt too far to reach the bushings. And, despite the compact shape and light weight, the obround still gives the outstanding load capacity and high efficiency for which the L-M Round-Wound core-coil construction is so well known.

Find Out About L-M Obrounds

L-M Round-Wound construction offers many advantages: high short-time overload capacity; low losses; balanced performance. The obround shape puts the frosting on the cake! Ask the L-M field engineer for facts and figures; or write for bulletins to Line Material Industries, Transformer Div., Zanesville, Ohio.

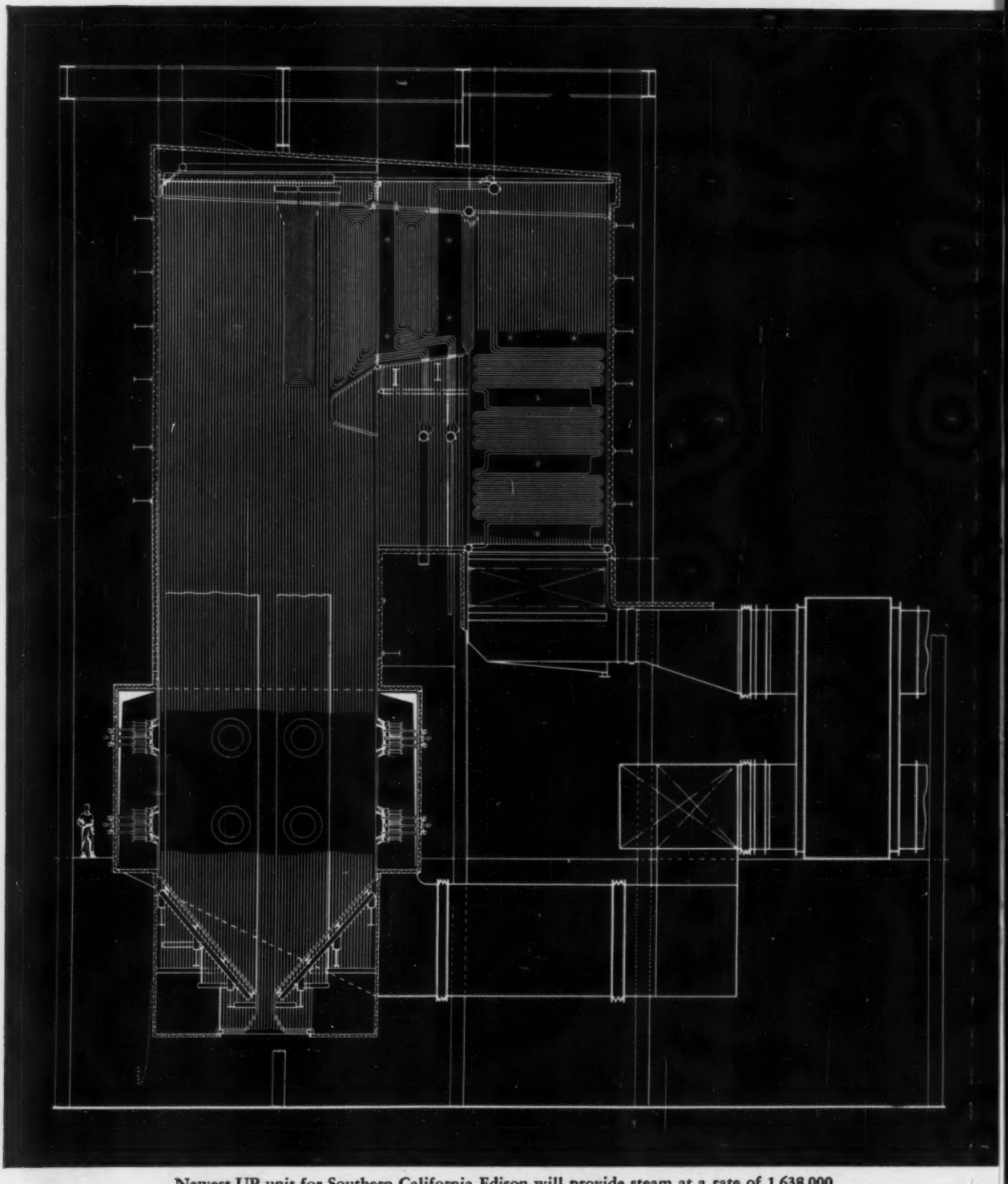
Distribution Transformers

McGRAW EDISON

341

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

A Big Step Forward-



Newest UP unit for Southern California Edison will provide steam at a rate of 1,638,000 lb per hour to a 210,000 kw turbine at a pressure of 2,400 psi and at a temperature of 1,050/1,000 F. Completion of the unit, which will burn either natural gas or oil, is scheduled for November, 1960.

Why Southern California Edison Purchased B&W Universal Pressure Boiler for 2400 PSI Operation

Once-Through Unit Reduces Capital and Operating Costs —Makes Use of Variable Pressure Possible

A big forward step in holding the line on the cost of producing electricity was taken by Southern California Edison in purchasing two B&W Universal Pressure units for its station at Huntington Beach, California.

Solid savings both in installed first cost and in operation stand behind this decision. Here are the facts:

INSTALLED COST

1. The overall cost of a Universal Pressure Boiler represents a saving over a drum type boiler for identical conditions.
2. Because height and weight of the UP Boiler are much less than those of drum type boilers, there are worthwhile savings in building and construction costs.
3. Superheat, hot reheat and cold reheat steam piping are reduced.
4. Foundation costs reduced because of 650 ton saving in weight of unit.
5. Drum transporting and lifting costs eliminated.
6. One level of stairs, walkways and elevator landing eliminated.

OPERATION

Many significant advantages from the UP's unique operating features helped shape Southern California Edison's decision. Here is what they found:

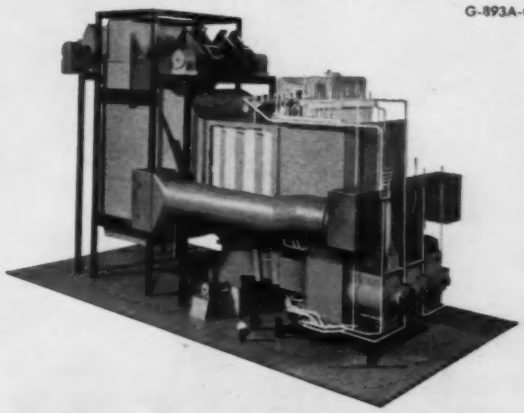
1. Constant steam temperature at all loads without use of tempering equipment.
2. Rapid response to load change.
3. Quick start up and shut down.
4. Simplified control system during normal operation.
5. Minimized operating complications when turbine is tripped.
6. Complete flushing of preboiler and boiler system is accomplished during every start up and shut down.
7. Reduced dependence on safety valves.
8. Elimination of water level gauge glasses and indicators.
9. Ease of acid cleaning.

The Universal Pressure Boiler helps the utilities' pressing need to hold the line on most of the important factors affecting cost of power generation.

Behind its many benefits stands the concrete performance of America's first successful commercial application of the Universal Pressure principle at the Philo Plant of the Ohio Power Company on the American Electric Power System. This unit has had a full year of performance under diversified conditions. Performance, ease of operation and freedom from major troubles have exceeded even the optimum original expectations.

We would be glad to discuss with you the advantages that the Universal Pressure Boiler can bring to your plant. Write to The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

G-893A-C5



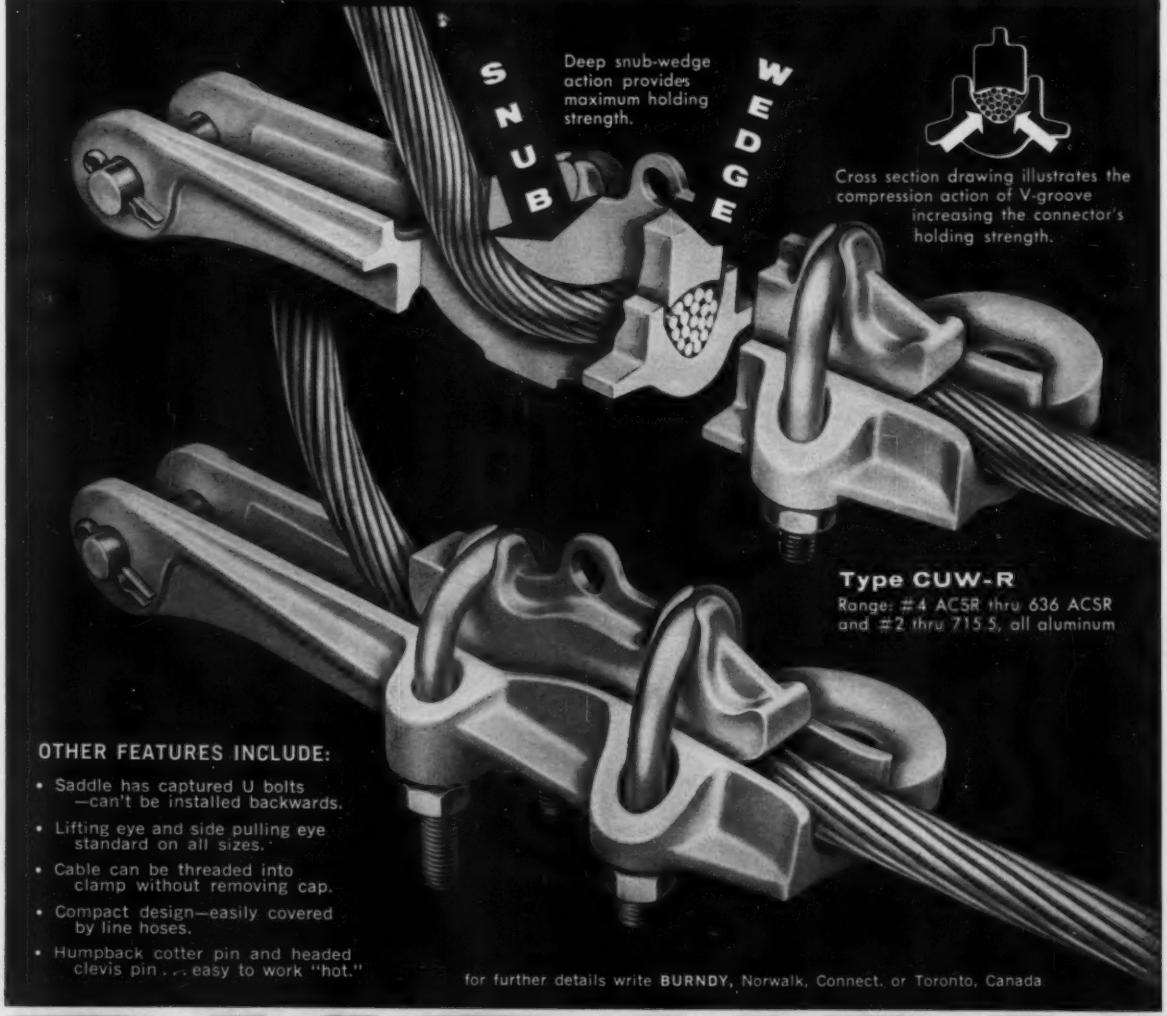
Model of the first Universal Pressure Boiler, which is now operating, uses once-through principle by which water, under pressure, is forced in one end of the system and emerges at the other end as superheated steam. This principle eliminates need for a drum.

BABCOCK & WILCOX

BOILER DIVISION

get the inside story on this aluminum

DOUBLE ACTION
LOW COST
DEAD END CLAMP


SNUB
WEDGE
Deep snub-wedge action provides maximum holding strength.
Cross section drawing illustrates the compression action of V-groove increasing the connector's holding strength.

Type CUW-R
Range: #4 ACSR thru 636 ACSR and #2 thru 715.5, all aluminum

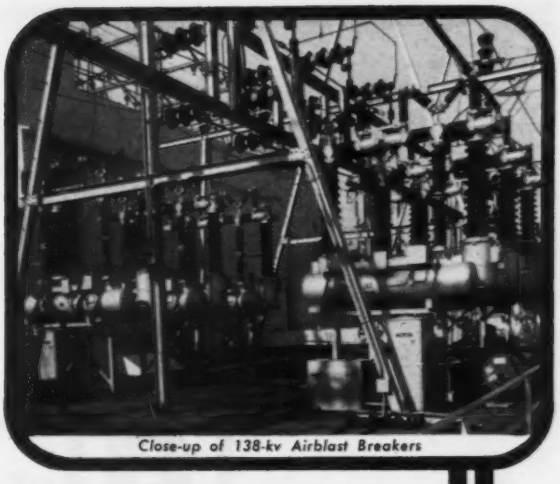
OTHER FEATURES INCLUDE:

- Saddle has captured U bolts —can't be installed backwards.
- Lifting eye and side pulling eye standard on all sizes.
- Cable can be threaded into clamp without removing cap.
- Compact design—easily covered by line hoses.
- Humpback cotter pin and headed clevis pin . . . easy to work "hot."

for further details write **BURNDY**, Norwalk, Connect. or Toronto, Canada

BURNDY

LOS ANGELES DEPARTMENT of WATER & POWER selects BROWN BOVERI AIRBLAST BREAKERS—

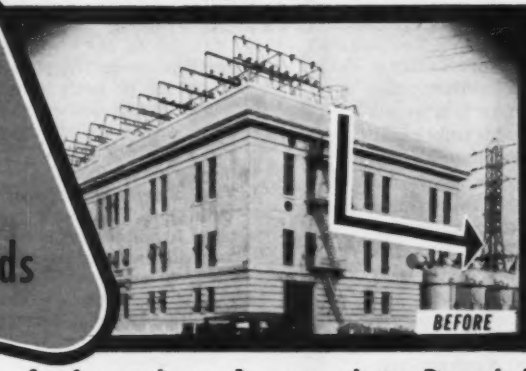


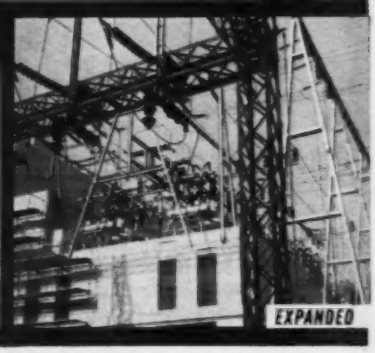
Close-up of 138-kv Airblast Breakers

THE KEY TO STATION "A" EXPANSION

—FROM 120 TO 300 MVA

- no structural changes
- no fire hazards





An Ingenious Approach to Receiving Station Expansion

RECEIVING Station "A" of the LOS ANGELES DEPARTMENT OF WATER & POWER was constructed in 1917 for an installed transformer capacity of 120 mva and the associated switchgear. Recent studies indicated the need for 300 mva transformer capacity (i.e. 2½ times the original figure) and higher interrupting capacity circuit breakers.

While the new transformers could be located in the yard, room for the 138-kv bus and five 138-kv, 5,000,000-kva breakers was obtained by cutting away part of the roof and walls of the third floor. Brown Boveri Airblast Breakers were selected for this unusual application.

* Since the building was erected in 1917, an engineering check was made to determine if the third floor would withstand the loading of an outdoor 138-kv oil circuit breaker of 5,000,000-kva interrupting capacity. Both dead weight and impact operation were studied. It was determined that, to accommodate an oil circuit breaker of this size, the floor would have to be heavily reinforced at considerable expense. Because of this requirement, it was decided to purchase air circuit breakers with light weight and negligible impact characteristics. Brown Boveri 138-kv, 5,000,000-kva air circuit breakers served by a central air supply were installed. Installation of this type of breaker made it unnecessary to reinforce the third floor level in any way, and they have proved very satisfactory in their performance.

* *Quoted from an article in March, 1957 issue of* ELECTRICAL WEST

BROWN BOVERI

BROWN BOVERI CORPORATION

19 Rector Street — New York 6, N. Y.

Atlanta, Ga. • Birmingham, Ala. • Boston, Mass. • Buffalo, N. Y. • Charlotte, N. C. • Chicago, Ill. • Cleveland, O. • Dallas, Tex. • Denver, Colo. • Detroit, Mich. • Hamilton, O. • Jacksonville, Fla. • Kansas City, Mo. • Knoxville, Tenn. • Miami, Fla. • Minneapolis, Minn. • New Orleans, La. • New York, N. Y. • Pasadena, Cal. • Pittsburgh, Pa. • Portland, Ore. • Roanoke, Va. • San Francisco, Cal. • San Juan, P. R. • Syracuse, N. Y. • Tucson, Ariz.

A Report On

COPPER and 8 points to consider

Today, with copper readily available, a new direction in electrical and electronic design is becoming apparent. There is a growing acceptance that many of the important new design requirements *besides* conductivity can be met by copper itself — as alloys, as laminates and as the pure metal. Sometimes it is merely the method of use which is changed to achieve optimum performance. But this is not just a rediscovery of copper — it is also the creative development of new alloys and new usages.

Here are just eight of the more important design requirements, besides conductivity, which are currently being met by some form of copper:

Conductivity plus
Strength and Reliability

The flexibility, resiliency and fatigue strength of certain copper alloys have long dictated their use wherever reliability was important. Some of these alloys have excellent mechanical qualities while still maintaining high conductivity. Cadmium bronze, for example, is 99% copper with tensile strengths, for hard-drawn wire, up to 90,000 psi. Excellent spring qualities with fatigue strength and wear resistance, even at high temperatures, can be obtained with beryllium copper. Superfine-grain phosphor bronze is a relatively new development useful in applications where enduring contact-point pressure is most important.

The reliability of the copper operative parts of electromechanical choppers is a basic reason for the return to these in place of electronic types in a number of missile applications.

Conductivity plus Heat
Dissipation and Hot Strength

Heat conductivity, of course, usually parallels electrical conductivity. In addition to the obvious uses of this property in heat exchange apparatus and appliances, many current applications are taking advantage of copper's heat conductivity, plus its good joining properties, to conduct heat away from more delicate components by means of cooling vanes and heat sinks.

Chromium copper's greater strength at elevated temperatures is finding new uses in mechanical-electrical parts such as commutator segments and resistance-welding electrodes. At 200C, for example, its tensile strength is about twice that of tough-pitch copper.

Conductivity plus
Corrosion Resistance

Commercially pure copper affords excellent resistance to industrial, marine and rural atmospheres, and to water, steam, alcohol, fuel oil, gasoline and sewage. Alloys have been developed to withstand many of the more active reagents. Recognition of this property has led to non-electrical uses in electrical equipment.

Conductivity plus
Forming Facility

The hot and cold workability of copper itself is excellent. In addition, coppers containing small amounts of tellurium have good machining properties while still retaining high conductivity. And extruded shapes can often be used to minimize the amount of forming needed.

Interesting new examples of copper's workability include cold rolling to thicknesses less than .0005 inches (for missile computer applications, foil coil transformers and flexible printed circuits). Another new development is the cold hobbing of solid copper, maintaining extremely close tolerances. With this process it is possible to produce *one-piece* magnetron cavities.

its ALLOYS

besides conductivity

Conductivity plus Joining Facility

Copper is, of course, easily and firmly soldered. Many of its alloys also lend themselves well to brazing and to oxyacetylene or gas-shielded arc welding. New methods of inert-gas metal-arc welding make it easy to weld pure copper.

Conductivity plus Bonding Facility

Copper's affinity for plating has made possible, for the first time, a really good bond with titanium, by flash coating the base metal with copper before plating with titanium. New developments in printed commutator-type circuits can take advantage of the exceptional wear resistance of rhodium because of the good bond it will form with the copper conductive layer. Continuing research is also being done on laminates of copper with other metals and plastics.

Conductivity plus Finish

Copper and most of its alloys, particularly the nickel silvers and low-zinc brasses, are useful for ornamentation and housings because of their cold-working properties and their ease of plating and finishing. The new fine-grain brasses provide a surface ideal for high finish.

Conductivity plus Availability

The copper industry's mine reserves and productive capacity are at a new high. Copper and copper alloys are now available in more shapes, sizes and material specifications than ever before. The long-range prospects are so good as to completely dispel any reservations lingering from the post-war years when stock-piling gave a surface appearance of short supply. Domestic mine capacity is scheduled to increase at an average rate of well over 20,000 tons per year. Free-world capacity, allowing for depletions, shows a projected 15% increase during the next five years.

And a word about conductivity itself. Even this classic property of copper merits a new examination. For example — silver-bearing copper, containing only 8 to 30 ounces of silver per ton, retains the high conductivity of copper, but has higher softening temperatures—and at commercially practical prices. Speaking of price, have you compared copper lately on a cost-per-mho basis with any other conductive metal you might be considering? You will find that this cost of conductance now makes it particularly economical to take advantage of copper's other properties.

The Copper & Brass Research Association is anxious to cooperate with you in finding a better way to solve your problems with copper. Write CABRA, 420 Lexington Avenue, New York 17, New York.

There's a new frontier in...

COPPER
BRASS
BRONZE

"WHY

BRINGING OUTDOOR MAINTENANCE INSIDE

SHELTERFOR-M* Metal-Clad Switchgear

Westinghouse SHELTERFOR-M, a new concept in outdoor switchgear, is designed to protect equipment and personnel from the weather and to provide complete comfort and safety during maintenance.

The inside work area is roomy enough to allow two breakers to pass in the aisle. Hinged panel located on the aisle provides easy access to relays, instrumentation and control equipment. Standardized construction means additional units can be added simply and quickly to meet increased loads and system expansion.

Auxiliary units can be furnished as options to serve as tool storage and battery areas, eliminating unsightly service buildings. Lighting facilities, convenience outlets and space heaters are provided.

Westinghouse SHELTERFOR-M is especially designed for modern suburbia. Clean, modern lines, coupled with paint and planting, effectively blend substations into surrounding landscapes. Compactness of design also means SHELTERFOR-M can be located on a minimum of expensive real estate without costly concrete service and drawout pads.

For full information about SHELTERFOR-M and 150-DH-1000 Circuit Breakers, call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

J-60941

From Plowback of Earnings into Research Comes Metal-Clad Switchgear with

. . . AIR CIRCUIT BREAKER HAVING 1 MILLION KVA INTERRUPTING CAPACITY

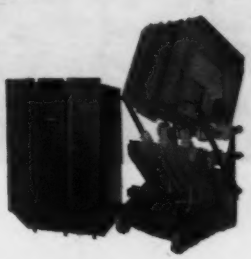
Westinghouse combines highest capacity with its exclusive De-ion® principle . . . fastest, most efficient method of arc extinction ever devised. The new H-type iron circuit creates a strong and uniform magnetic field. The blowout coil in the center in series with the arc splits the arc in two so there are essentially two interrupters in series.

Main contacts are the self-aligning multiple-line butt type. Chutes are hinged for easy access to contacts.

*SHELTERFOR-M Shelter for Maintenance

YOU CAN BE SURE...IF IT'S

Westinghouse



Clamp than I need 2"

"WHY buy more

Clamp than I need?"

NEW O-B QUADRANT STRAIN CLAMP IS EXCELLENT FOR LOW-COST DEADENDS

"Why buy more clamp than I need?"

If that's your question, then the new O-B light weight Cooline LW clamp is your answer.

It's the same basic design as the heavy-duty aluminum Cooline clamp, used for many years on transmission, sub-transmission and primary distribution lines. But this new aluminum quadrant strain clamp, is lighter weight, costs less, and is designed especially for low stringing tensions.

Like the heavy-duty Cooline, the new LW clamp has a powerful snubbing action which has high holding power without crushing the conductor. The six models in the new Cooline series cover a range from .2 to 1.3 inches in conductor diameter, with ultimate strengths from 7000 to 18000 pounds. Conductor can be strung at deadends with continuous loop . . . no need to cut and splice.

Here's a clamp that is right in step with today's trends in distribution and transmission construction and in keeping with the O-B policy of offering the widest available selection of materials for deadends. Ask for this new O-B Cooline LW the next time you order strain clamps.

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Six models of new O-B Cooline series cover conductor diameters from .2 to 1.3 inches.

4363-H

Motor drive gives these miniatures high torque, unusual accuracy

No galvanometer type drive here!

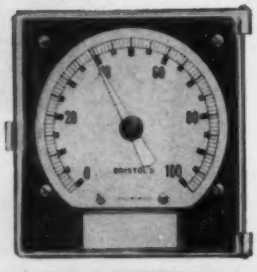
Bristol Series 663 Miniature Electronic Dynamaster* Recorders and Indicators employ a two-phase, motor-driven, slide wire self balancing principle. Here's plenty of torque for operating alarm contacts, electric control contacts, or retransmitting slidewires. Dead band is only 0.15%. Here, too, is twice the accuracy . . . ½% of scale . . . you get in ordinary miniatures.

Full plug-in flexibility, too. You can interchange chassis of the 663 in 10 seconds . . . replace it with either recorder or indicator instruments . . . both plug in easily without tools. Chassis also pulls out to intermediate position for chart changing and inking without disconnecting from circuit. Easy range change, too.

These features simplify planning of graphic control panels. They permit centralized recording and/or indicating of a large number of variables in minimum space. 15 miniatures mount in less space than two full sized units. Human engineering makes 3″ charts and dials easy and accurate to read.

Remember, too, only Bristol offers full lines of both full size and miniature instruments. You can count on unbiased recommendations and dependable instrumentation from Bristol. The Bristol Company, 116 Bristol Road, Waterbury 20, Connecticut. B-12

*T. M. Reg. U.S. Pat. Off.



SAME INSTRUMENT also made as an indicator, interchangeable with recorder of similar characteristics in 10 seconds. Actual size: 5″ x 5½″.

BRISTOL TRAIL-BLAZERS IN PROCESS AUTOMATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Powerhouse that grew

The Toledo Edison Company sets the pace for the growth of the area it serves... *by building for the future.*

Typical of the dynamic power industry, the Toledo Edison Company anticipated future expansion when they designed Bay Shore Station No. 1. Now, less than three years after completion of this modern unit, it is being doubled in size to keep ahead of the growing demand for dependable electric power.

American Bridge, which built the first Bay Shore Unit for Toledo Edison Company, also fabricated and erected the steel for Bay Shore Station No. 2.

Transmission towers, too! American Bridge has been designing and fabricating transmission towers for Toledo Edison Company for 38 years! A few years ago, incidentally, we designed and delivered *ninety-two* 100′ high towers to this growing Midwestern power company for its 15-mile Bay Shore 138,000-volt line.

USS is a registered trademark

American Bridge Division of USS United States Steel

General Offices: 525 William Penn Place, Pittsburgh, Pa.

Contracting Offices in: Ambridge • Atlanta • Baltimore • Birmingham • Boston • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Elmira • Gary • Houston • Los Angeles Memphis • Minneapolis • New York • Orange, Texas • Philadelphia • Pittsburgh • Portland, Oregon • Roanoke • St. Louis • San Francisco • Trenton

United States Steel Export Company, New York

There Is No Magic Formula for Producing Substations, as Southern States Has Found from 910 Installations

As much as we like the idea of standardization, the one thing we have learned is that there is no cut-and-dried, assembly-line, easy way to produce substations.

We've been at it 28 years, producing more than 900 substations of all kinds, and it has always been tough for us!

Even stations with essentially the same assignments have endless arrangements. Infinite combinations of design preclude standardization. Each station must be virtually a custom-made project.

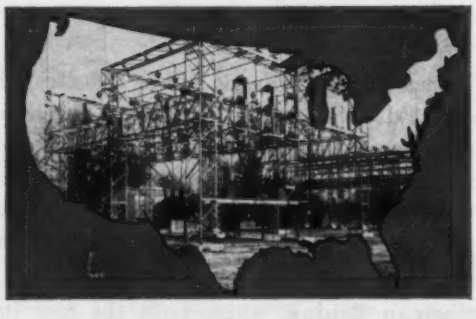
True, hundreds of designs in our files are helpful. Many standard components are picked up and used, with ultimate savings to our customers. And the practical experience of our design staff guides us around many pitfalls.

But you can't escape the fact that supplying substations requires these basic functions: skillful engineering, careful detailing, precise coordination of production schedules, and delivery on time. At least, that's what we've learned. And that's how Southern States approaches every substation assignment.

On this basis, you might like to do business with us. We'll welcome your inquiry. Just call your Southern States representative or write direct to us.

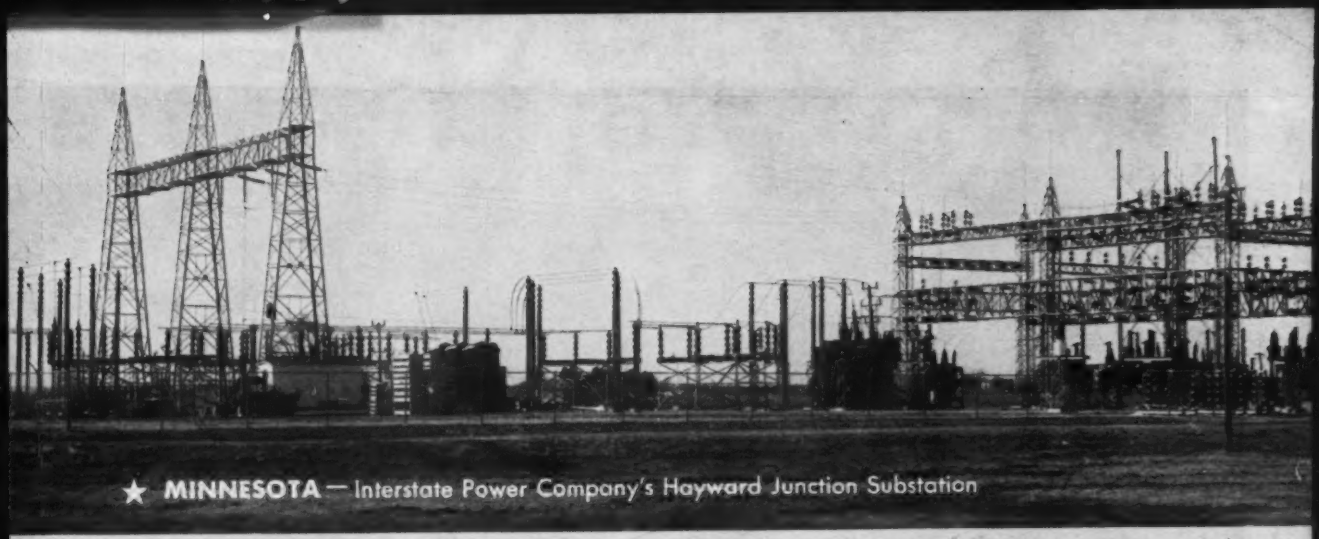
SOUTHERN STATES SUBSTATIONS ARE IN USE ALL OVER THE NATION

During the past 28 years Southern States has produced 910 outdoor substations for hundreds of different customers. The stations range from small 5,000 kva units to switchyards exceeding 1,000,000 kva. Regardless of size, Southern States pays close attention to every detail—from the single-line wiring diagram to the finished station.



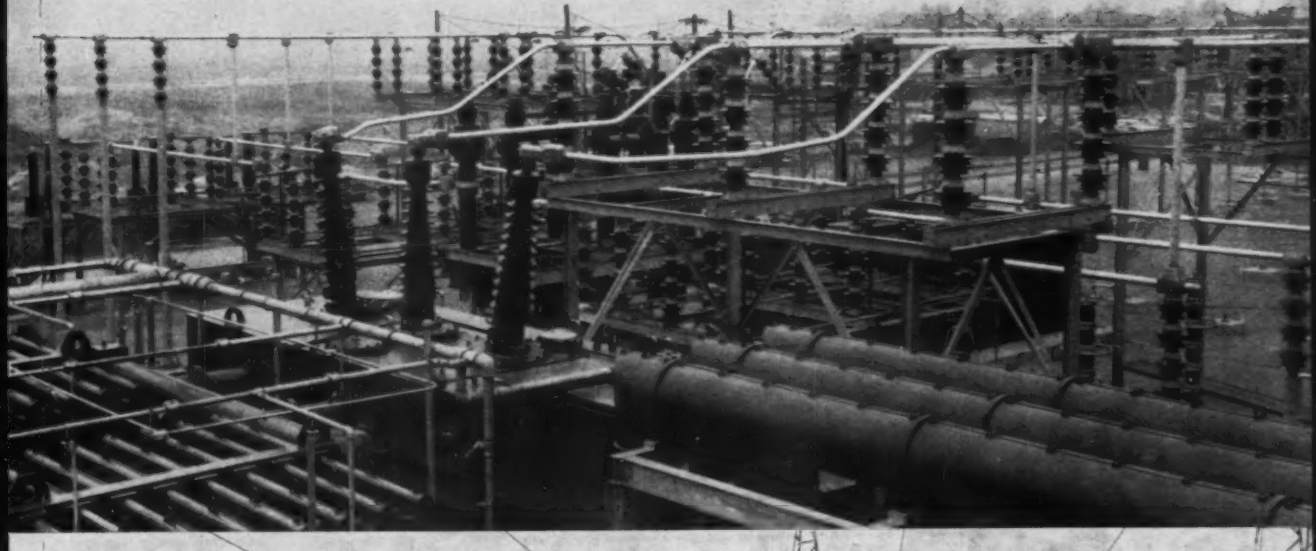
SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

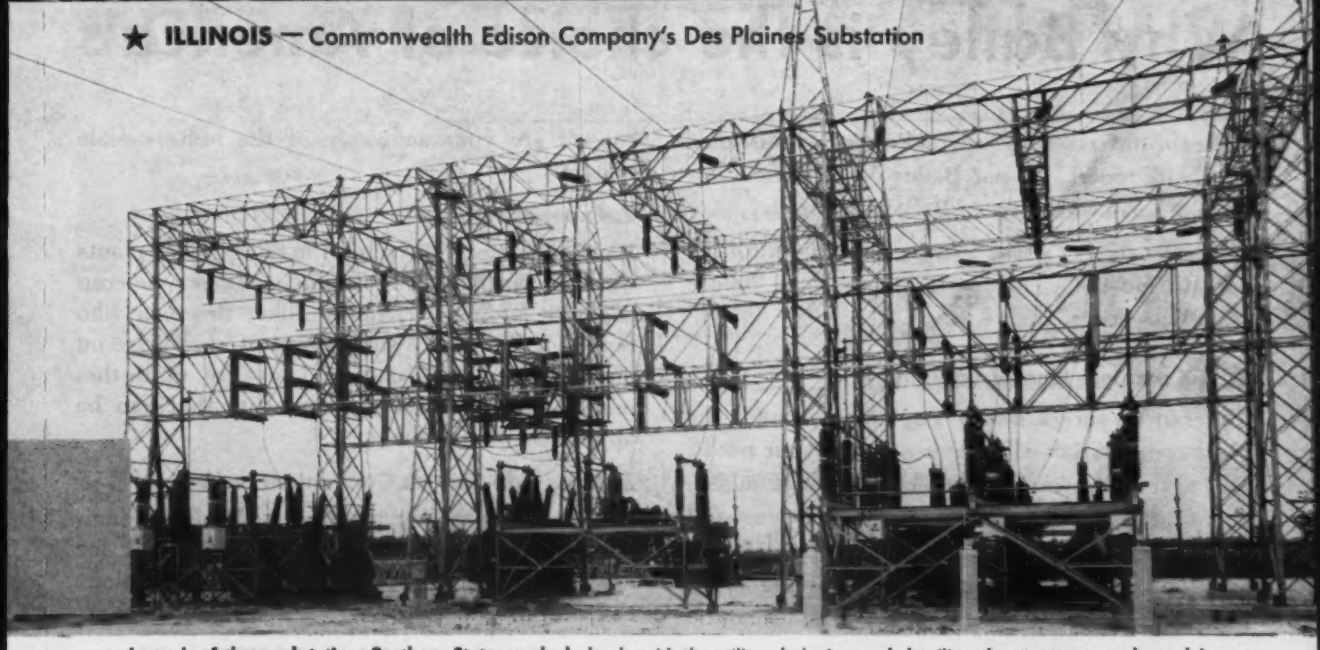


★ **MINNESOTA** — Interstate Power Company's Hayward Junction Substation

★ **NEW YORK** — Consolidated Edison's Corona Substation



★ **ILLINOIS** — Commonwealth Edison Company's Des Plaines Substation



In each of these substations Southern States worked closely with the utility, designing and detailing the structures; and supplying many components, including structural steel, air break switches, disconnects, buses, cable conductors, connectors, and bus supports.

Why Bailey is the choice of America's

Take the top six on the Federal Power Commission's heat rate report. All use Bailey Meters and Controls. Five of the six chose Bailey *exclusively!*

Coincidence? Let's take a *larger* sample. Out of the top 46 "most efficient" power plants listed, 38 use Bailey products. Here's why:

1. A Complete Line of Equipment

You can be sure a Bailey Engineer will offer the right combination of equipment to fit your needs. Bailey manufactures a complete line of standard, compatible pneumatic and electric metering and control equipment that has proved itself. Thousands of successful installations involving problems in measurement, combustion, and automatic control are your assurance of the best possible system.

2. Experience

Bailey Engineers have been making steam plants work efficiently for more than forty years. Veteran engineer and new engineer alike, the men who represent Bailey are storehouses of knowledge on measurement and control. They are up-to-the-minute on the latest developments that can be applied to your problem.

3. Sales and Service Convenient to You

There's a Bailey District Office or Resident Engineer close to you. Check your phone book for expert engineering counsel on your steam plant control problems.

Bailey Controls for Combustion, Feed Water and Steam Temperature at the St. Clair Power Plant of Detroit Edison Company. The FPC reported a 1956 heat rate at St. Clair of 9,200 Btu per kwhr, making it the sixth most efficient plant in the United States.

MOST EFFICIENT* STEAM PLANTS!

***6 MOST EFFICIENT PLANTS**

1956 Heat Rates Reported by FPC

	Btu/kwhr	Meters	Combustion Control	Feed Water Control	Supht. Control
1. Tanners Creek (Indiana and Michigan Electric Company)	9,106	B	B	B	B
2. Kanawha River (Appalachian Electric Power Company)	9,115	B	B	B	B
3. Kyger Creek (The Ohio Power Company)	9,176	B		B	B
4. Muskingum River (The Ohio Power Company)	9,176	B	B	B	B
5. Clifty Creek (Indiana-Kentucky Electric Company)	9,200	B	B	B	B
6. St. Clair (The Detroit Edison Company)	9,200	B	B	B	B

B—Bailey Equipment

A140-2

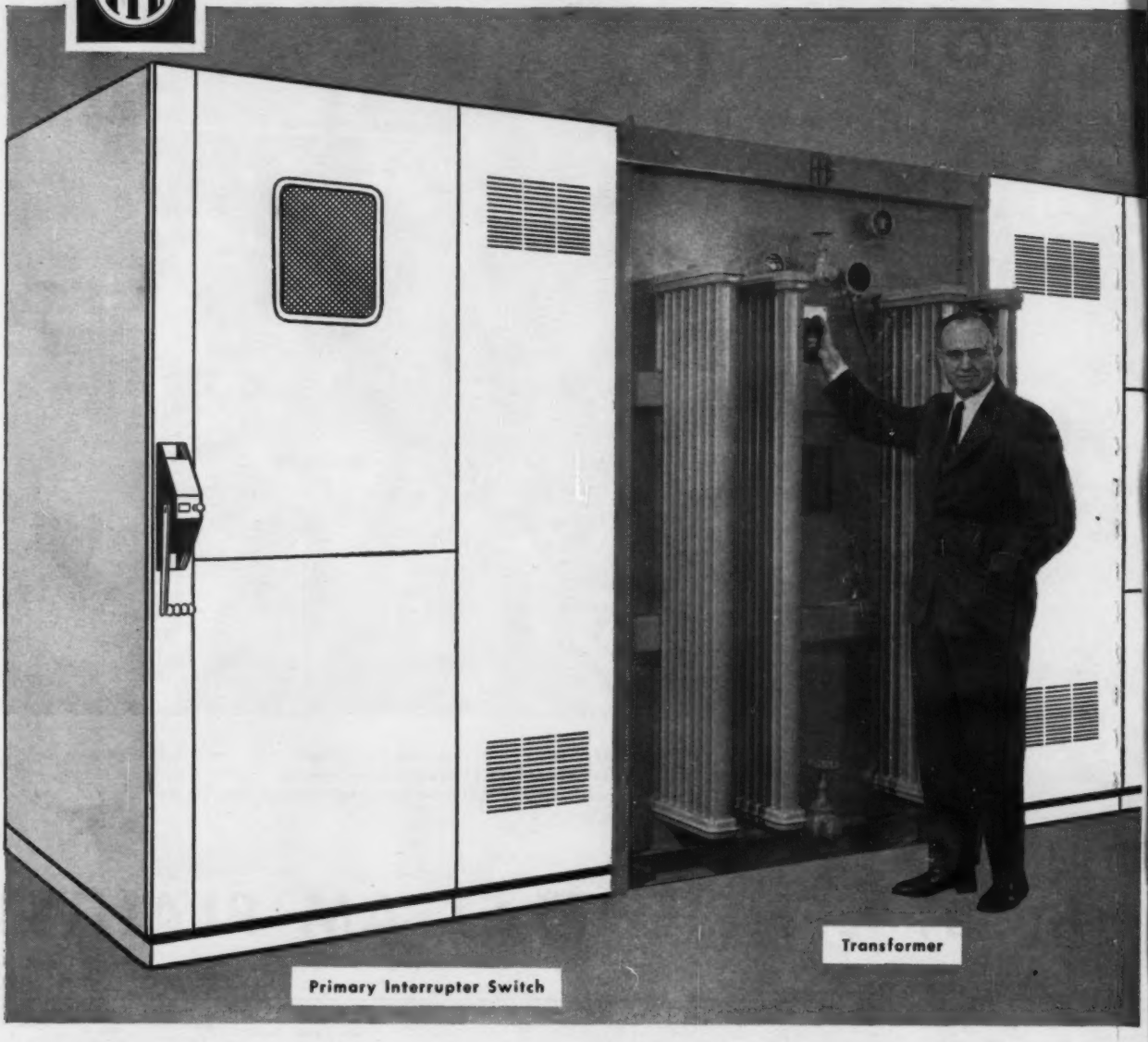
Instruments and controls for power and process

BAILEY METER COMPANY

1060 IVANHOE ROAD • CLEVELAND 10, OHIO

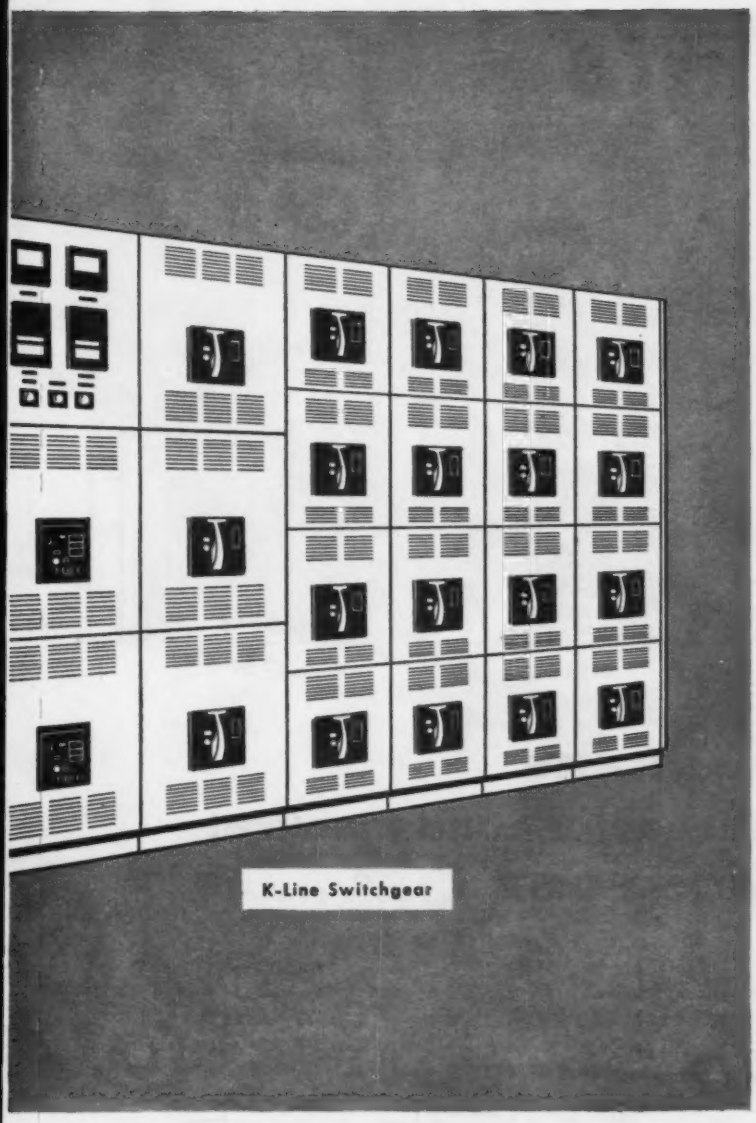
In Canada—Bailey Meter Company Limited, Montreal

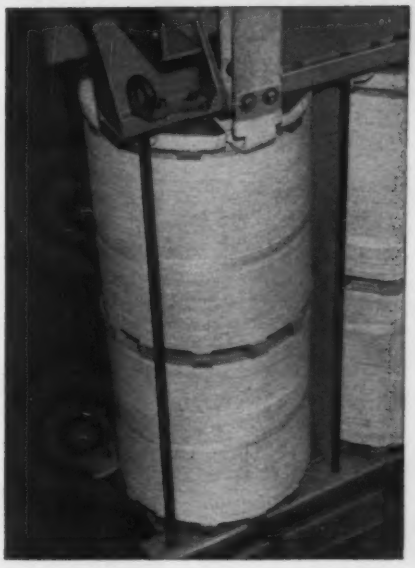
SECONDARY UNIT SUBSTATIONS



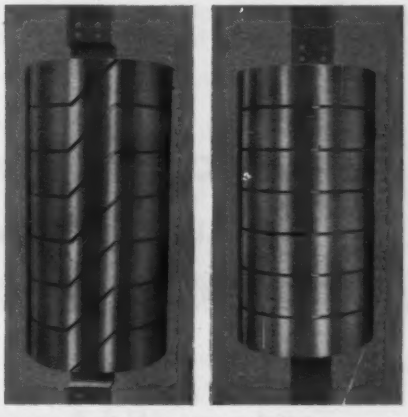
TRANSFORMERS BUILT ON FRESH IDEAS

New designs, incorporating latest ideas, insure more dependable performance, better looking units





Coils stay put. Double jackscrews in combination with tie rods between upper and lower core clamps hold coils rigidly in place, even under severest short circuit stress.



Brute strength secondaries. A fresh approach to high current secondaries for dry type transformers is this coil formed from solid copper bus. This unique design embodies great structural strength, and high conductivity.

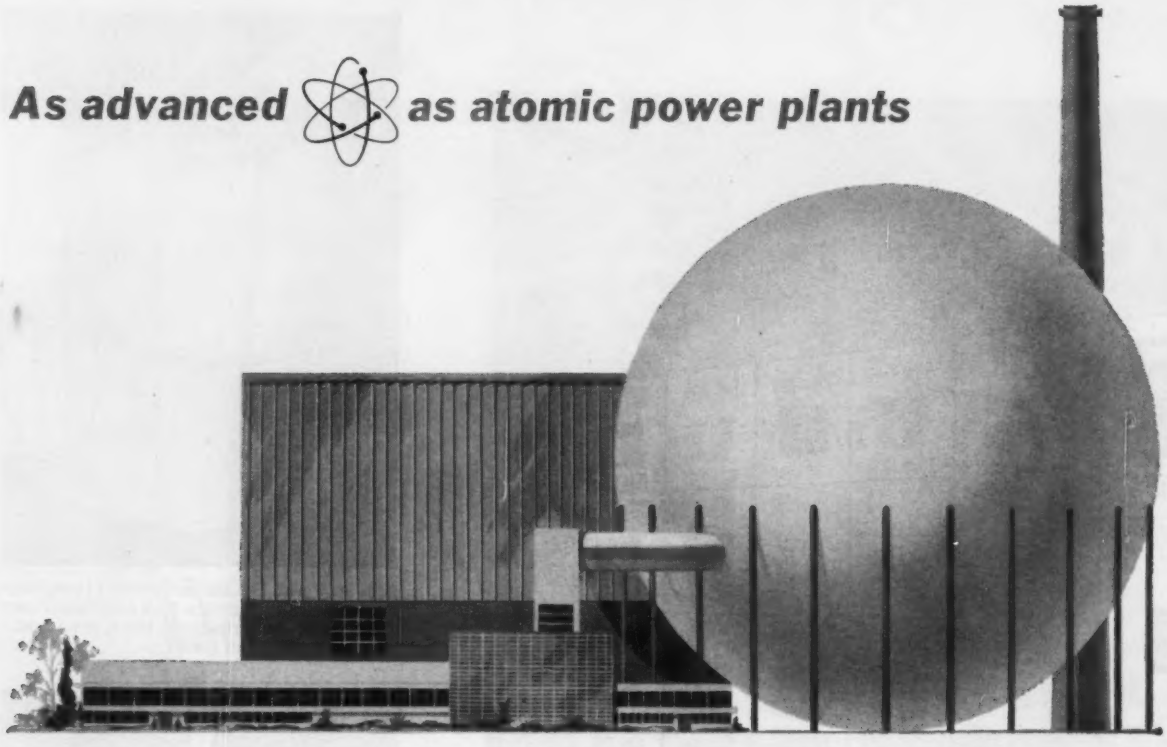
Look what I-T-E gives you now in unit substations: transformers designed fresh from the ground up . . . incorporating developments based on the most up-to-the-minute transformer technology.

This fresh approach to transformer design and construction has produced remarkable new gains in transformer performance: greater dependability, stronger construction, more effective use of materials.

Only I-T-E offers you unit substations completely engineered and built in a single plant . . . insuring coordinated engineering, easier ordering, simultaneous delivery of all elements, simpler installation, and a single, dependable name in back of them. Write for complete details. Switchgear Division, I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa. In Canada: Eastern Power Devices Ltd., Port Credit, Ont.

I-T-E CIRCUIT BREAKER COMPANY
PHILADELPHIA, PENNSYLVANIA

As advanced as atomic power plants



INFILCO ION EXCHANGERS

treat boiling water reactor condensate at

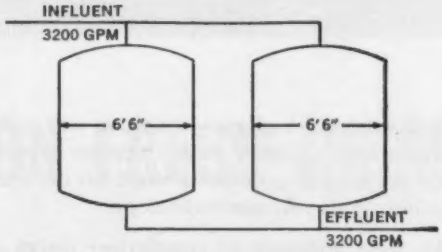
50 GPM PER SQUARE FOOT

Two 6'-6" diameter mixed bed demineralizers with a total surface area of 64 sq. ft. are now being installed to handle 3,200 gpm of reactor condensate. These units will produce polished condensate with a conductivity of approximately 0.1 micromho in a fraction of the space and at much lower installation cost than conventional equipment.

The plant design is based upon extensive pilot plant studies using a 24" diameter unit to treat unfiltered condensate at 200 gpm (68 gpm per sq. ft.). The equipment and techniques developed for this plant are also applicable to high pressure conventional and super-critical pressure plants.

Results of pilot plant studies and design features of this ultra-modern installation will be sent free upon request. Write today for Reprint #88.

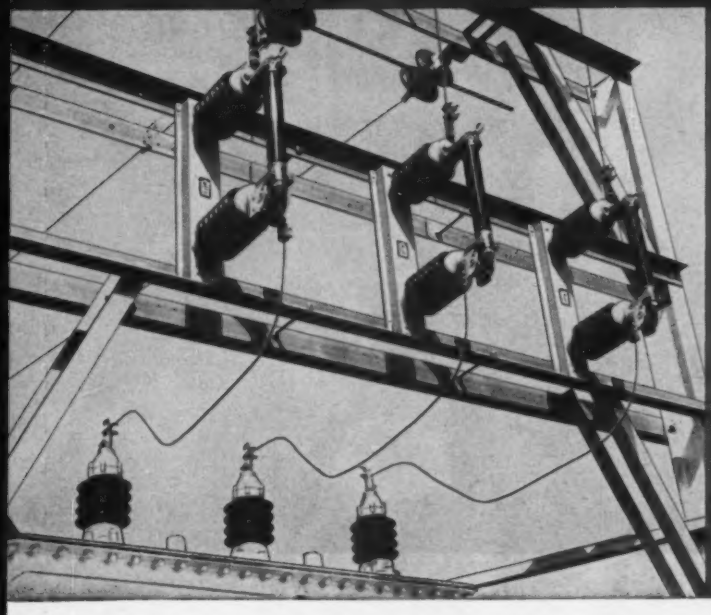
Infilco Inc., General Offices: Tucson, Arizona, P.O. Box 5033
Field Offices throughout the United States and in foreign countries.



INFILCO

THE ONLY COMPANY impartially offering equipment for ALL types of water and waste processing—coagulation, precipitation, sedimentation, flotation, filtration, ion exchange and biological treatment. 88503

S&C's SM Power Fuses redesigned for new, higher interrupting ratings!



1,000,000 kva
at 34.5 kv

750,000 kva
at 23 kv

500,000 kva
at 14.4 kv

A new principle in boric acid circuit interruption has been incorporated into the SM Power Fuse, to provide substantially increased ratings to match today's higher system faults. And the SM still retains the following advantages that have made it the number one choice of the electrical utilities:

1. As a power transformer primary fuse, the SM can give you two-fold protection—to transformer and to system; the fuse has time-current characteristics which permit selective operation (coordination) with source and load (secondary) relays.

2. The SM Fuse can be re-fused at nominal cost.

3. The SM Fuse may be applied at any voltage up to its rating. It is not "voltage critical."

4. In blowing, the SM Fuse does not bring about recovery voltages that will interfere with lightning arrester application.

5. The SM Fuse cannot be damaged by surges, ageing, or vibration.

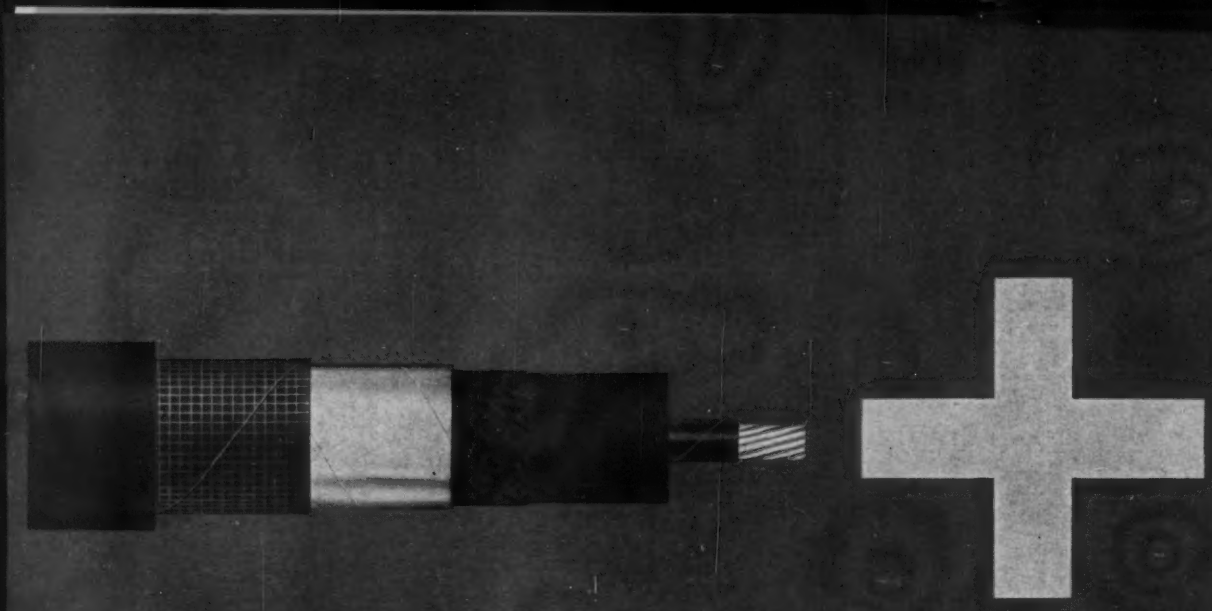
6. The SM Fuse can interrupt the complete range of fault currents—from the lowest current that will sever the fusible element to the maximum rating of the fuse.

For further information, write to S&C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Company, Ltd., 8 Vansco Road, Toronto 14, Ontario.

Specialists in High-Voltage Circuit Interruption Since 1910

S&C POWER FUSES

Disconnects • Cutouts • LOADBUSTER® • Interrupters • Metalclad Switchgear • Fuse Links • Power Fuses



ANACONDA
DURASHEATH CABLE

Anaconda Durasheath rubber-insulated, neoprene-jacketed power cable and Anaconda splicing kits were made for each other—and for you. Together, they make your wiring job easier, faster, more economical.

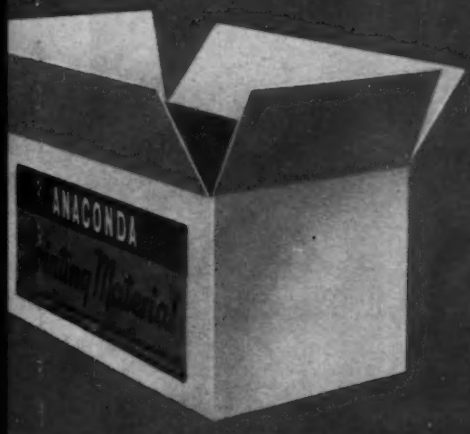
Anaconda Durasheath. First, Anaconda Durasheath* provides a superior-quality power cable with a proven record for safety, dependability, long life. Its flexibility and its versatility can effect important savings in your installed-costs budget.

A special abrasion-resistant neoprene jacket makes it possible to install Durasheath three ways: aerially, in ducts, or underground . . . in continuous runs with minimum splices. Durasheath's light weight permits use of lighter supports . . . longer spans.

Anaconda Accessories. Where splices are necessary, Anaconda Accessories – all fully engineered by cable experts – come into the picture. For in an Anaconda Jointing Kit you have every item you need for a single splicing job. No time lost assembling the necessary materials – or going back for forgotten items. The job is simplified, takes minimum time. In addition, responsibility is concentrated because your cable and your cable accessories have come from the same dependable manufacturer – Anaconda!

See the Man from Anaconda today about Durasheath power cable (5 kv., 15 kv. and higher) and Anaconda Jointing Kits. Write for Bulletin DM-5817 on Anaconda Durasheath Cable and Bulletin C-79-13-14 on Anaconda Accessories. Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.

*Trademark 55377



MONEY SAVINGS
TIME SAVINGS
EASY INSTALLATION
SURE CONNECTIONS
PROVED
PERFORMANCE
CONCENTRATED
RESPONSIBILITY

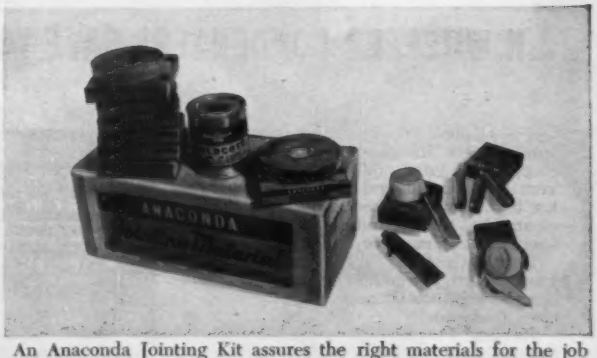
ANACONDA FULLY ENGINEERED JOINTING KITS

ANACONDA DURASHEATH ALL-PURPOSE POWER CABLE

Available in all sizes, single and multiple conductor, copper or aluminum, 600 to 15,000 volts and higher.

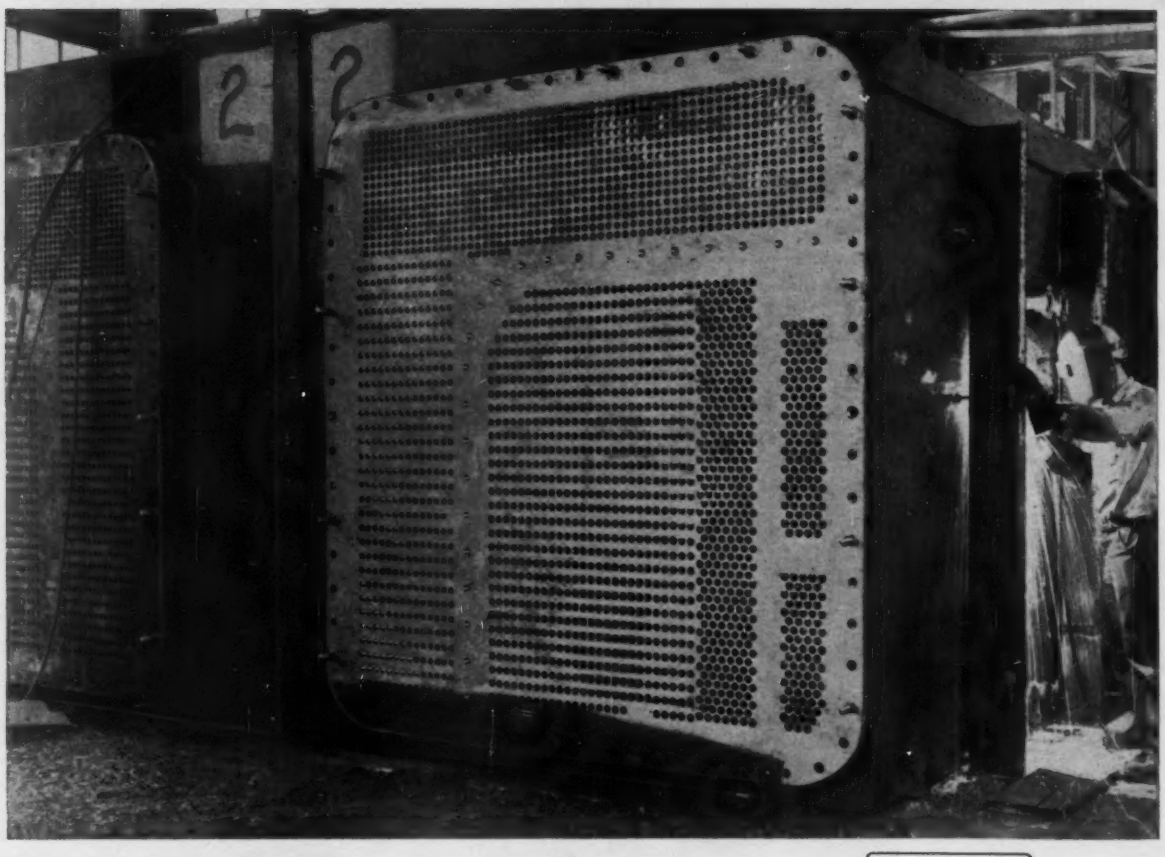
Insulations: Type RHW, Anaconda ANW, AHW or AB, each designed for specific purposes and described fully in new publication DM-5817.

Jacket: Specially compounded neoprene with high resistance to flame, oil, acids, alkalis, sunlight and ozone; has high tensile strength and flexibility! Densheath (PVC) and Polyethylene jackets are available for special applications.



An Anaconda Jointing Kit assures the right materials for the job when and where you need them. Shown above: contents of kit for 3-conductor, shielded-type rubber-insulated Durasheath cable. Similar kits also available for solid-type, varnished-cloth, thermoplastic- and paper-insulated cables.

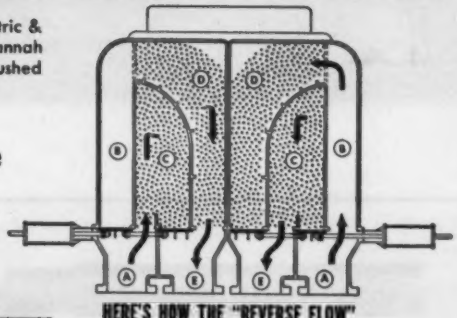
SEE THE MAN FROM **ANACONDA**
FOR **DURASHEATH AND ACCESSORIES**



C.H. Wheeler Reverse Flow Condenser prior to installation at Savannah Electric & Power Company's Riverside Station. Reverse Flow principle could save Savannah hundreds of dollars: leaves, twigs, algae and other foreign matter can be flushed from tubes and tube sheets without shutting down the unit.

BECAUSE Reverse Flow design eliminates hours of costly down time

C.H. WHEELER CONDENSERS SAVE YOU MONEY



HERE'S HOW THE "REVERSE FLOW" PRINCIPLE WORKS

Left Side Shows Normal Operation: Water enters inlet A with right port open, flows through tube bank C to rear of condenser; then it returns through tube bank D to front of condenser and discharges at point marked E.

Right Side Shows Reverse Flow: Sluice gates move on a common stem. Water flows up through channel B, through tube bank D to rear of condenser; returns through bank C to front of condenser.

In the C.H. Wheeler Divided Water Box design each half of the condenser can be back-flushed independently of the other; or both halves can be back-flushed simultaneously, with one or two circulating pumps operating.

Let's suppose the condenser tubes and tube sheets in your station become clogged. If your condenser is of conventional design and serves a 200,000 kw turbine, you'd need many hours to clean the tubes, and each hour you spend could cost as much as $330!*

But with C.H. Wheeler's Reverse Flow design, you could flush away debris in a few minutes without shutting down the Condenser!

Reverse Flow is only one of the features of C.H. Wheeler Dual Bank Surface Condensers which save you money. Other money-saving features which result from Wheeler's 55 years experience in designing and building Condensers and auxiliaries, include better tube sheet design and advanced engineering of Tubejet® Steam Jet Ejectors, Condensate Pumps and Circulating Pumps.

*Based on an estimated cost of $8,000 per day for shutdown of a 200,000 kw Turbine-Generator.

C.H. WHEELER SAVES YOU MONEY IN THESE WAYS, TOO:

- Pure condensate
- Lower absolute pressure, higher vacuum
- "Zero" condensate temperature depression
- Deaeration to 0.03 cc. of oxygen per liter. (Special design provides for deaeration to 0.01 cc. per liter.)

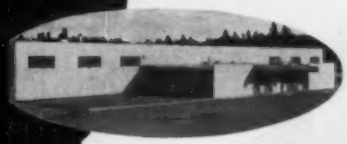
C. H. WHEELER MFG. CO.

19th and Lehigh Avenue • Philadelphia 32, Pennsylvania

Whenever you see the name C.H. Wheeler on a product, you know it's a quality product.

Steam Condensers • Steam Jet Vacuum Equipment • Centrifugal, Axial and Mixed Flow Pumps • Marine Auxiliary Machinery • Nuclear Products

RT&E grows to better serve the growing west



NOW IN OPERATION!

a New RT&E Manufacturing Plant in Portland Oregon

RT&E Corporation proudly announces completion of its new western manufacturing plant in Portland. Operations started on May 1. This fully integrated facility, with 23,000 square feet of office and manufacturing space, will provide faster service for transformer users in the eight western states. In addition to manufacturing, it will add another outlet to R T & E's nation-wide branch distributing warehouses to serve this growing area.

In its rapid but steady growth over the past eleven years, R T & E has continuously relied on three basic ingredients to achieve success——— people, product, and facilities.

1 PEOPLE... skilled people to manage, engineer, build, and sell

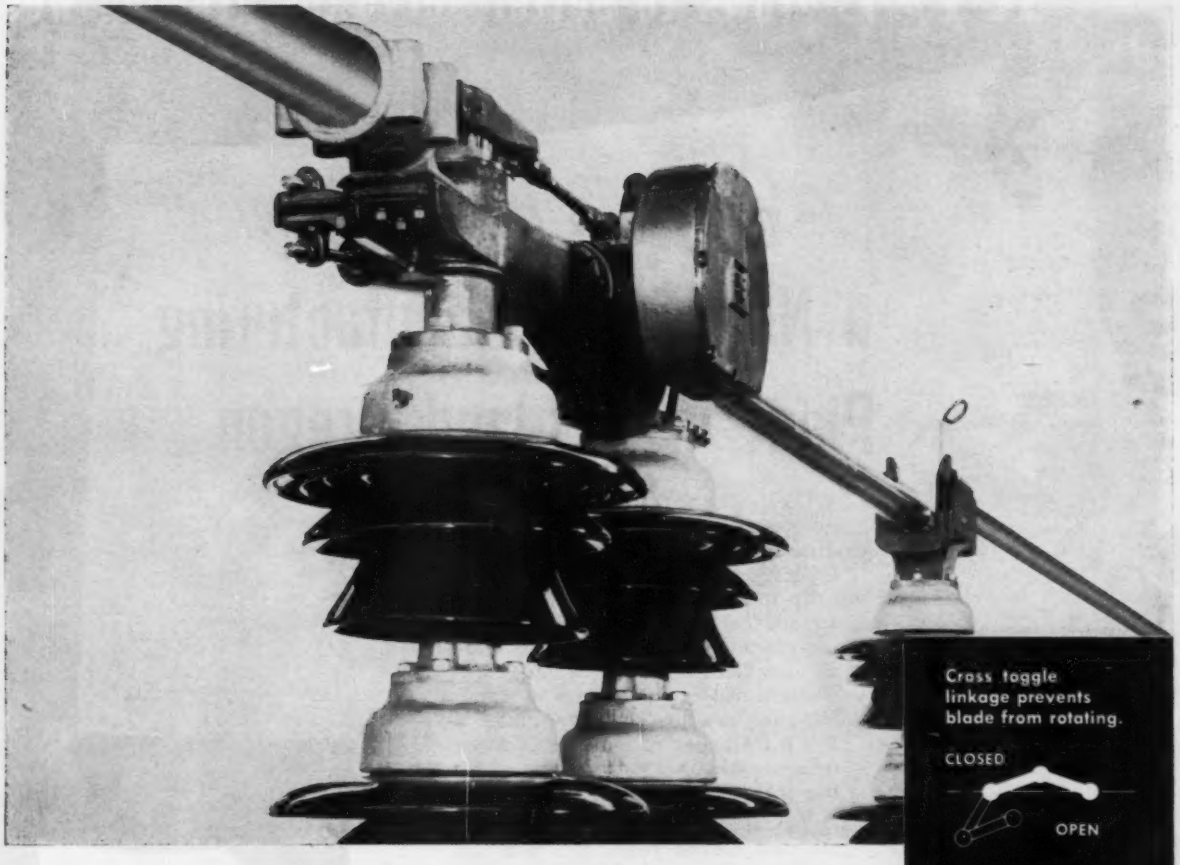
2 PRODUCT... a superior product, creatively designed and carefully made.

3 FACILITIES... modern machinery, distribution, and plant facilities.

ENGINEERING TALENT CONCENTRATED ON ONE IDEA — A BETTER TRANSFORMER

RT&E CORPORATION

WAUKESHA, WISCONSIN — PORTLAND, OREGON



Cross toggle linkage prevents blade from rotating.

CLOSED

OPEN

Magnetic forces push blade into, not out of, contact.

Blade is locked under a solid ledge of the contact support, not the contacts.

3E

HM50'S Three watchdog features hold Blade closed during high-momentary CURRENT TRANSIENTS

The HM50 Switch is completely new . . . its design and every detail planned to satisfy the stringent standards of today's high voltage systems . . . standards that can no longer be met by beefing up old designs.

The multiple finger contacts on the HM50 are the result of exhaustive research to determine the characteristics best suited to constant current requirements and the equally important ability to resist the heat and shock of system short circuit transients. Each finger, with its own spring action, provides a high pressure contact. The total effect of multiple fingers is an extremely efficient contact. There are no small gaps to set up vibrations or other undesirable physical or chemical reactions. The number of contacts, their size, shape and other characteristics are those we found most efficient in ordinary use and best able to resist short circuit momentaries.
Blade rotation and lifting are entirely independent motions that take place in smooth uninterrupted sequence. The operator has complete control of the blade position at all times as the blade is counterbalanced to a nicety.
The HM50 Switch meets or surpasses all NEMA Standards.

From 69 HKV to 230 KV and in amperage ratings from 600 thru 2000 amps.

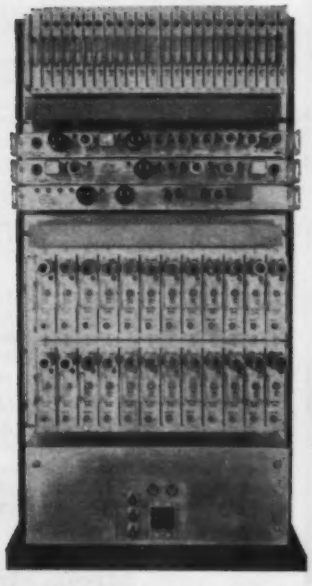
WRITE FOR NEW BULLETIN 334

ELECTRICAL ENGINEERS EQUIPMENT CO.
MELROSE PARK, ILLINOIS

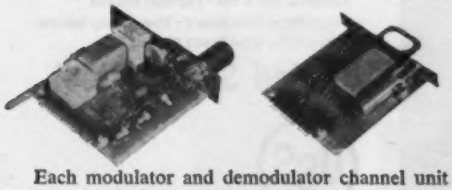
Representatives in principal cities

Kellogg Sets New Standards of Reliability in Microwave

Backed by the world-wide technical, manufacturing, installation and operating experience of ITT



New MICROPLEX provides 23 plug-in channel units in 3½ feet of space—a 4:1 size reduction



Each modulator and demodulator channel unit features printed circuitry.

Microwave was pioneered by ITT in 1931 with the Channel crossing from Calais to Dover. Today Kellogg Microwave is achieving new levels of reliability: 99.998%, far superior to wire line systems! Operating in dozens of installations throughout the world, Kellogg's *complete* communications package includes:

- *Microwave* — operating in the 2,000 and 10,000 megacycles bands.
- *Terminating Equipment*—for automating functions, including teletype, telemetering, remote control, data transmission.

Part of the Kellogg 10-C Microwave System is the new 10-C-2 "Microplex": a 23 or 45 channel PTM multiplexing equipment. It features printed circuits, miniaturized components, minimum maintenance, and occupies only three-and-one-half feet of rack space. All demodulators are semi-passive—only one tube per channel; modulators are passive—no tubes. The 23 channels use 41 tubes with an input of 180 watts —a 5:1 reduction in power consumption.

MICROPLEX may also be packaged in one seven-foot rack to provide 45 channels; or 23 channels with two-wire termination and tone signaling. Signal crosstalk is 62 db and signal-to-noise (F1A) is 70 db for 23 channels.

Our engineering staff is always at your service—ready to discuss your communications problems. Write for complete details.

Kellogg Switchboard and Supply Company,
6650 S. Cicero Avenue, Chicago 38, Illinois.
Communications Division of International Telephone and Telegraph Corporation.

Kellogg Offices and Warehouses:

CALIFORNIA
23 Broderick Road
Burlingame, Calif.
OXford 7-5780
TWX SAN MATEO CAL 06

GEORGIA
1594 Southland Circle, N.W.
Atlanta 18, Georgia
SYcamore 4-2441
TWX AT 351

ILLINOIS
4600 So. Tripp Ave.
Chicago 32, Illinois
CLiffside 4-4300
TWX CG 3296

KANSAS
7th & Sunshine Road
Kansas City 15, Kansas
MAyfair 1-4418
TWX KC KAN 1055

MINNESOTA
6100 Excelsior Blvd.
Minneapolis 16, Minn.
West 9-6715
TWX MP 1195

NEW JERSEY
165 Prospect Street
Passaic, New Jersey
PRescott 9-3610
TWX PAS 1067

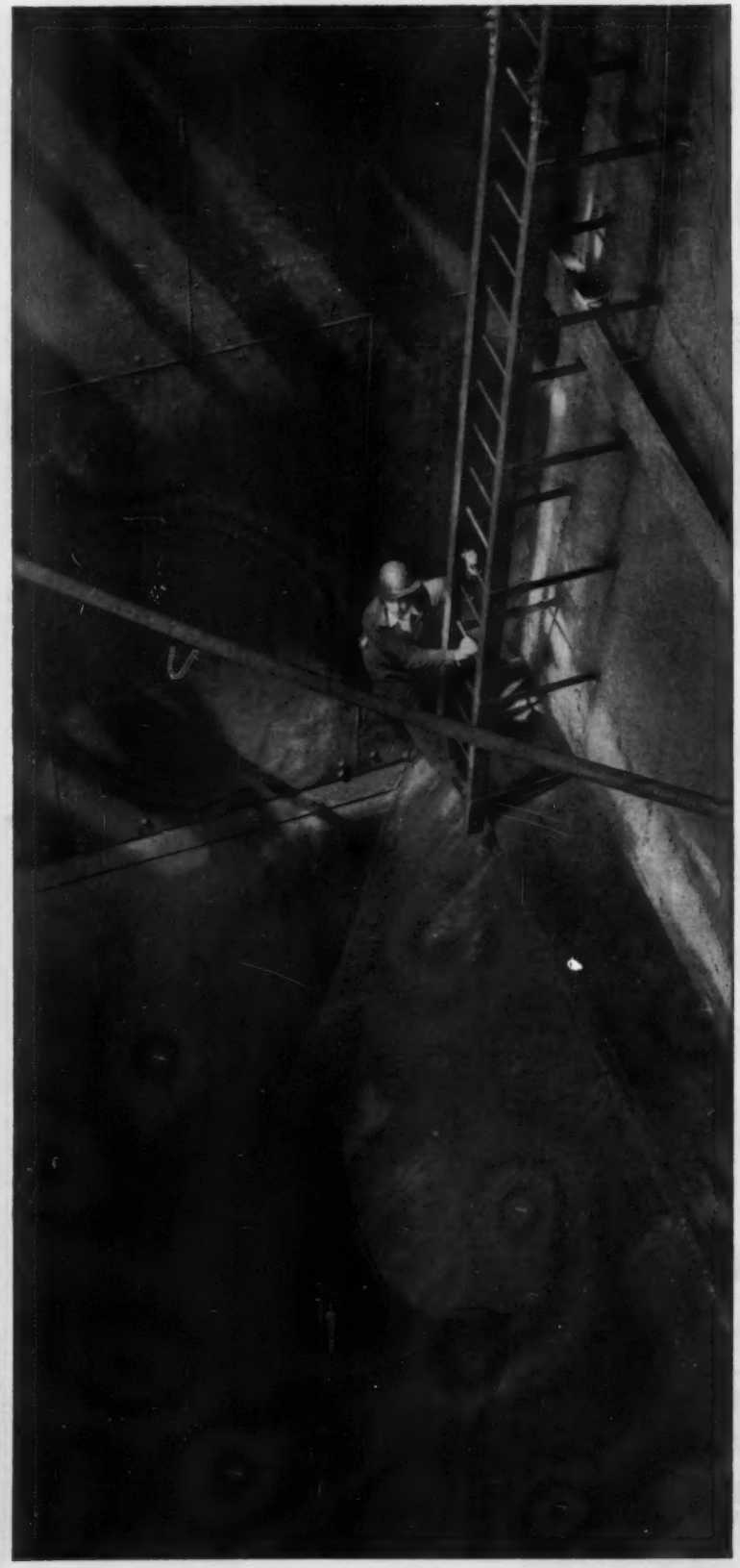
OHIO
1555 West Fourth Street
Mansfield, Ohio
LAfayette 4-6511
TWX MANS 0 132

TEXAS
1515 Turtle Creek Blvd.
Dallas 7, Texas
RIverside 7-5191
TWX DL 02

EXPORT—165 Prospect Street, Passaic, New Jersey
PRescott 9-3610, TWX PAS 1067

KELLOGG
CHICAGO, ILLINOIS
Communications Division of ITT

Coal hoppers, chutes and liners are among the many applications in which USS "T-1" Steel has greatly increased service life.



How to **beef-up** your equipment without adding fat

Build it stronger, tougher and lighter with USS "T-1" Steel plates. This remarkable steel was developed especially to meet the need for bigger machines and stronger, more durable equipment, built larger but with lighter components.

"T-1" Steel's greater strength reduces weight. Furnished quenched and tempered to 100,000 psi minimum yield strength, USS "T-1" Steel plates permit designers to reduce the thickness of steel used for water turbine cases, penstocks, transformers and many supporting structures. Weight reductions of 25% to 50% are possible. This in turn cuts freight and welding costs and reduces foundation requirements. USS "T-1" Steel plates can still be furnished to 90,000 psi min. yield strength and 105,000 psi min. tensile strength to meet the requirements of ASME Code 1204-3.

"T-1" Steel lengthens service life. For maximum resistance to impact abrasion, USS "T-1" Steel is furnished quenched and tempered to 321 minimum Brinell. It is recommended for applications such as coal chutes, hoppers, pulverizer feed pipes, exhaust pipes and liners for ash collectors. Users report increases in service life up to 100% or more.

"T-1" Steel is weldable. It's unusual that a steel so strong and durable can be readily welded in the field without pre- or post-heating. This characteristic permits on-the-spot fabrication at minimum cost.

Write for free "T-1" booklet which contains design and application information, as well as helpful hints on fabrication of this versatile constructional alloy steel. United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

USS and "T-1" are registered trademarks

United States Steel Corporation—Pittsburgh
Columbia-Geneva Steel—San Francisco
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Steel Service Centers
United States Steel Export Company

United States Steel

USS

These smaller-lighter
WAGNER FORM W TRANSFORMERS
offer

MECHANICAL and ELECTRICAL ADVANTAGES

that mean

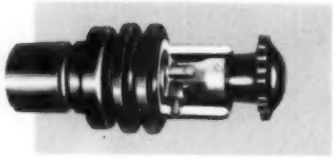
EASIER INSTALLATION
SAFER OPERATION
LONGER SERVICE LIFE

MECHANICAL FEATURES
that give you easier installation... safer operation

WAGNER
DISTRIBUTION

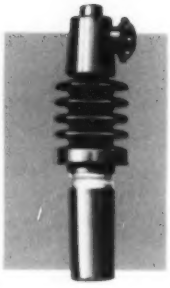
HIGH VOLTAGE SIDEWALL BUSHING

Connections can be made faster—more safely because chuck type terminal eliminates need for tools and insulated hand knob protects lineman when tightening the terminal. Takes either copper or aluminum conductor.

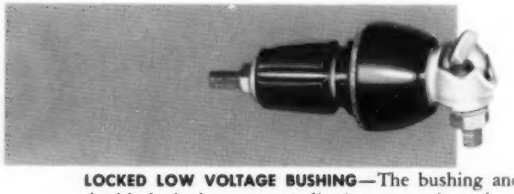


HIGH VOLTAGE COVER BUSHING

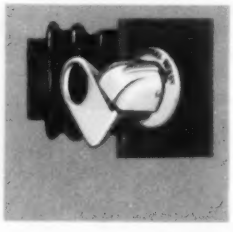
Bushing has phenolic insulating cover for bird and squirrel protection. Connections are quickly and easily made with the clamp type terminal and insulated hand knob. Plated clamping surfaces permit use of copper or aluminum conductor.



SHUR-SEAL CLAMPING RING—Holds cover to the tank with an airtight seal . . . no atmospheric moisture or dust particles can get inside to contaminate the oil and shorten transformer life. No oil can leak out during shipping or handling. Cover may be removed by loosening a single bolt.



LOCKED LOW VOLTAGE BUSHING—The bushing and terminal are double locked to prevent slipping or turning when terminals are tightened. Eliminates loose inner terminal connections that could cause short circuits. Can be used with aluminum or copper conductor.



WINDING TEMPERATURE OVERLOAD INDICATOR*

Flashes a red warning light to give advance indication that overloads are nearing the danger point. Helps you prevent service interruptions. Indicator is actuated by winding temperature—eliminates time delay of oil temperature actuation.

*Can be furnished on transformers from 3 to 100 kva.

Wagner has 67 years of experience in transformer engineering and manufacturing. In the Form W design, Wagner offers the electric utility industry a complete line of transformers for modern distribution systems.

Form W Transformers are designed and built to NEMA standards, are given all prescribed commercial tests, and production line impulse tests to meet Wagner's standards for uniformly high quality. They are small in size—light in weight . . . easy to handle, to store, to mount on poles.

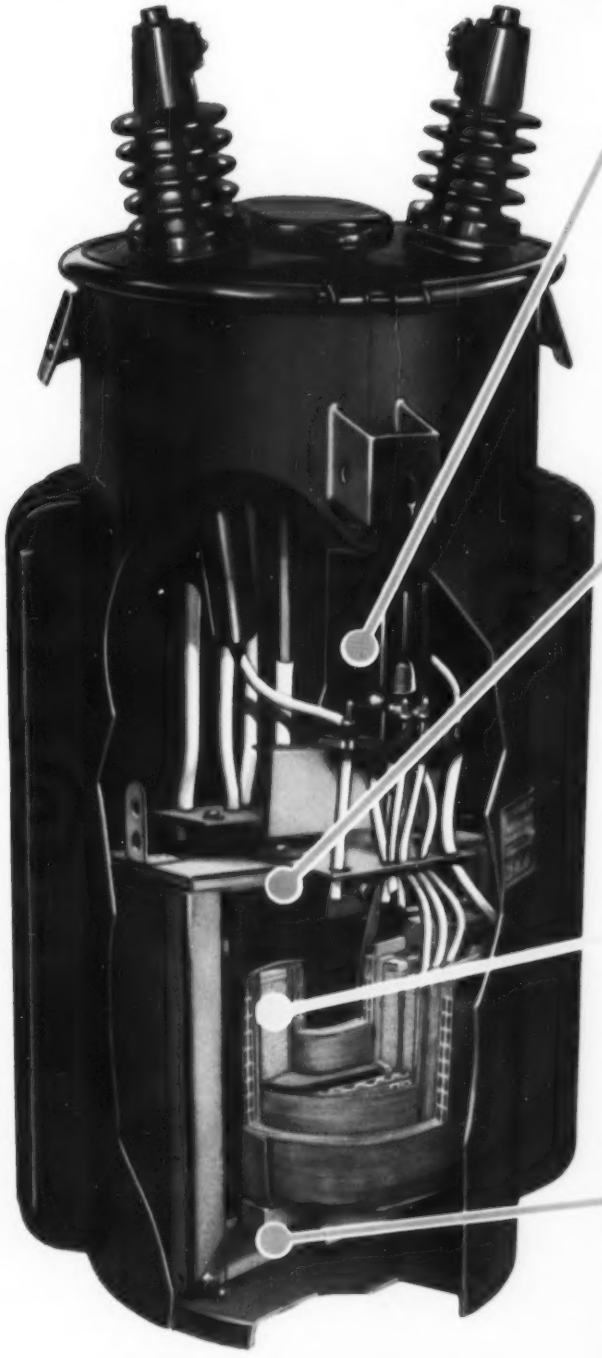
The Form W line includes a complete range of single-phase ratings, 500 kva and smaller, 69 KV and below, in conventional or protected types. All ratings from 3 to 167 kva, 15 KV and below, are designed for pole mounting.

Call the Wagner Sales Engineer in your area for complete information about Form W Transformers, or write for your file copy of Wagner Bulletin TU-141.

Wagner Distribution Transformers

FORM W TRANSFORMERS

ELECTRICAL FEATURES
that add up to long, troublefree service life



ROTARY TAP CHANGER

Easily accessible through cover hand hole. Handle and index plate are above oil level in the tank. Gives positive action because a pre-loaded spring in the handle (note cutaway) keeps constant pressure between the contacts and the tap studs.

FORM W CONSTRUCTION

CORES of cold rolled oriented grain transformer steel are specially annealed for the lowest possible magnetic losses. Cores are cut into two turn sections and are assembled through and around the coils, without need of banding.

COILS are wound of carefully selected pure copper wire or strip. Insulation of high dielectric strength is used between layers in the high and low voltage windings. This insulation has crimped edges which hold the windings firmly in place for permanent electrical clearances.

BONDED INSULATION

Layer, channel and barrier insulation is coated with a thermo-setting material that bonds the coil structure into a unit with great mechanical and electrical strength.

ENDPLATE STRUCTURE

The Form W element is clamped in an endplate structure that is light but strong. This structure holds all parts securely in position and provides a firm mounting for the tap changer and lead supports.

the choice of leaders in the electric utility industry

Wagner Pole-Type

FORM W TRANSFORMERS

...available from stock in all standard ratings to meet your distribution system requirements

TYPE HEB—5000 Volts and Below. Typical Construction — 3 through 15 KVA.

TYPE HEK—5001 to 15,000 Volts. Typical Construction — 25 through 50 KVA.

TYPE HEB—5000 Volts and Below. Typical Construction — 25 through 50 KVA.

TYPE HEK—5001 to 15,000 Volts. Typical Construction — 75 and 100 KVA.

TYPE HEB—5000 Volts and Below. Typical Construction — 75 and 100 KVA.

TYPE HEK—5001 to 15,000 Volts. Typical Construction — 167 KVA.

LIVE BETTER ELECTRICALLY

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

WT58-11

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6400 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U. S. A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

NOW...you get even better performance with Wagner FORM W Transformers

- **LOWER EXCITING CURRENT**
- **LOWER IMPEDANCE**
- **BETTER REGULATION**

Wagner's engineering research and development departments are working at full speed to bring you greater values. The Wagner line of single phase pole-type distribution transformers has been redesigned to give you more efficient, longer lived units for your loads of today and tomorrow. Lower exciting current and lower impedance values have been achieved. The percentage of voltage drop from no load to full load has been improved for better regulation.

GUARANTEED LOSSES REDUCED—Wagner's published electrical performance sheets for a 25 Kva, 7200 volt transformer show that guaranteed core losses have been cut approximately 12 per cent... total losses cut approximately 5 per cent. Other Kva and voltage ratings have correspondingly-improved loss ratios.

SMALLER SIZE—The size of these redesigned transformers has been substantially reduced. The 25 Kva Type HEK Transformer, for example, is now only 37 inches high, including the cover-mounted bushings... a reduction of almost 10 inches in height.

Choose these improved Wagner Form W Transformers for your lines—ask your Wagner Sales Engineer for the full story. There's a Wagner Branch in every principal city.

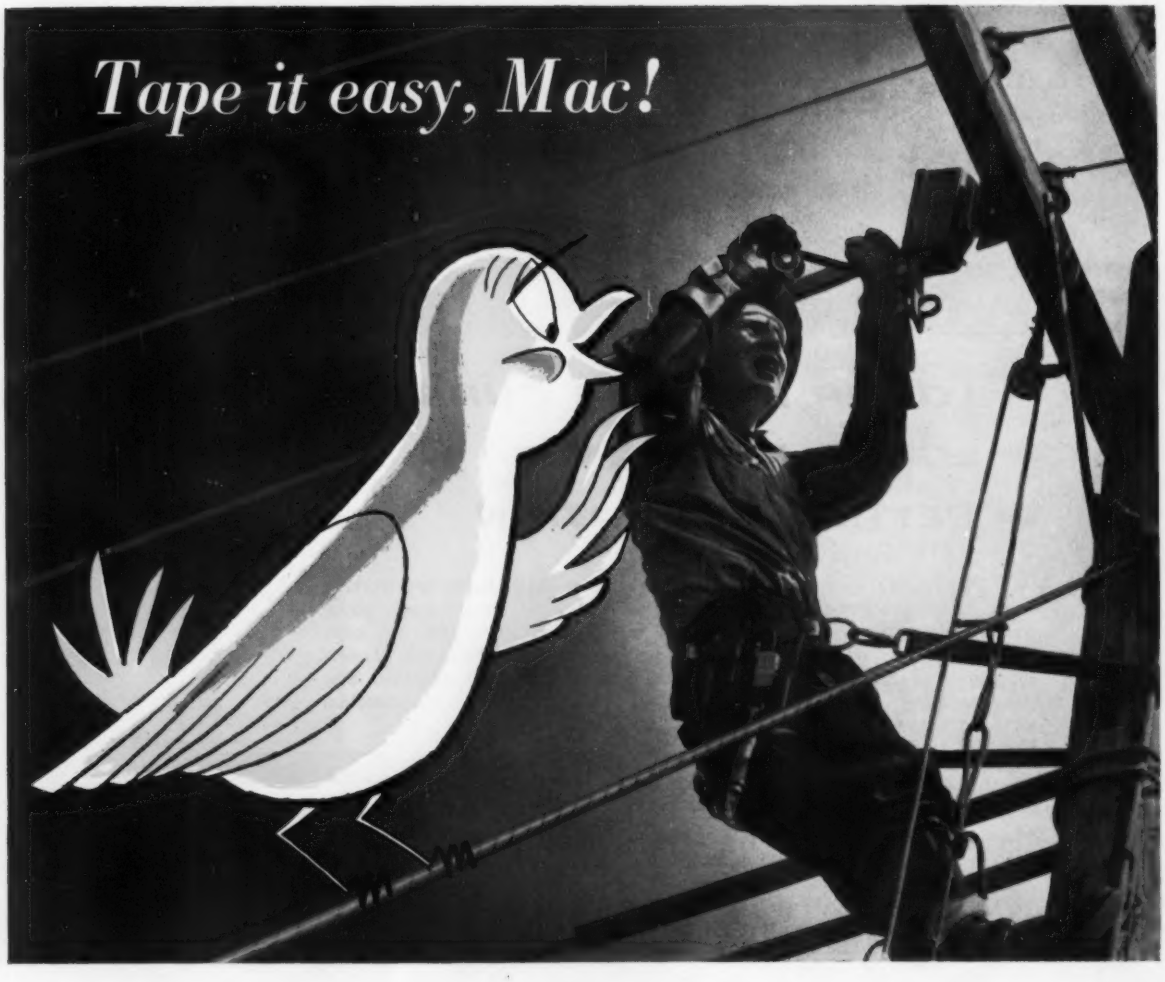
TYPE HEK

LIVE BETTER ELECTRICALLY

Wagner Electric Corporation

6456 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U. S. A.

WT58-18



Gold Seal Tape splices neatly, fast

It has high dielectric strength without bulk — a big advantage in many splicing jobs. It's elastic . . . easy to mold into a neat, thin wrapping. Just what the doc ordered for cramped areas, but we birds see more Gold Seal used for insulating cable splices than any other tape. High service line or terminal box, quality and convenience *talk* — and that's Gold Seal Plastic Tape, in the handy 20 ft. roll. Try it! Jenkins Bros., Rubber Division, 100 Park Avenue, New York 17.

Ten 20 ft. rolls in the Handy Pack can
Single 60 ft. rolls in individual metal cans

Gold Seal Tape

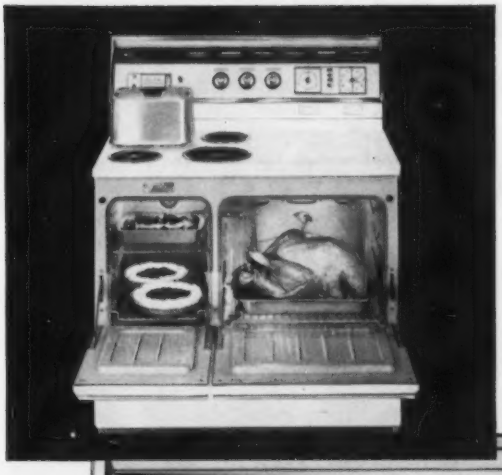
IN HANDY 20 FOOT ROLLS

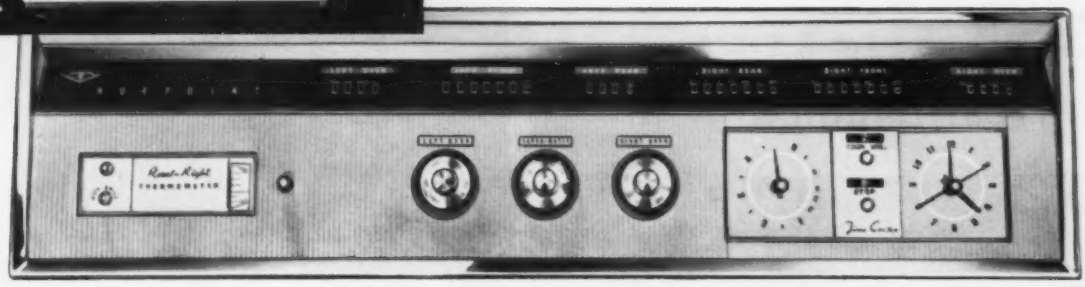
Gold Seal FRICTION — RUBBER — **PLASTIC** Tapes . . . Commercial and Specification Grades

PUT FULL HOUSEPOWER TO WORK

Hotpoint ELECTRIC RANGES

have the Difference that builds load and revenue... automatically!



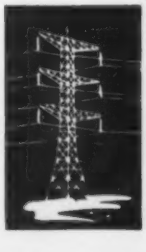


Hotpoint Electric Ranges help you build sales, load and revenue with all of the brilliant advances in quality, styling and completely automatic operation that make up the Hotpoint Difference. For example, the distinctive new control panel above provides automatic command of all surface and oven units—both time and temperature—at the touch of a button.

There's an optional new "thawer oven" that thaws frozen foods faster, doubles as a surface baking unit. And a new "touch open" storage drawer that glides out in response to a touch of the toe or hand. An exclusive meat thermometer in the Super Oven, controlled with one simple setting, signals when the roast or fowl is done just right.

These imaginative, yet practical advantages are just a few samples of the sale-exciting features offered by the dramatic Hotpoint Difference. Hotpoint Ranges will help you put more POWER in "Housepower"— more LIVING in "Live Better—Electrically!"

LIVE BETTER ELECTRICALLY



LOOK FOR THAT **Hotpoint DIFFERENCE**

(your customers do!)

Network Protectors Tested in ⅓ the Time

With New Westinghouse Universal Test Kit

Now . . . protector check out time can be reduced by 70 percent, compared to present testing techniques.

The Westinghouse test kit can be used with any network protector up to and including 480-volt, wye or delta styles for over-all operational tests, component checks, master phasing and insensitive relay calibration. Check these other money-saving features:

1. Three-phase field tests—relay calibration better than meter shop accuracy.
2. Protector left on normal system voltage—all components in circuit.
3. Also provides single component testing.
4. Test leads are cable bundled—multiple plug for quick hook-up.
5. Cable length permits remote testing of protector from outside the vault.
6. Extra-heavy-duty carrying case.

For more facts to cut your network maintenance costs, call your Westinghouse Sales Engineer. Or, write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-60963

YOU CAN BE SURE...IF IT'S

Westinghouse

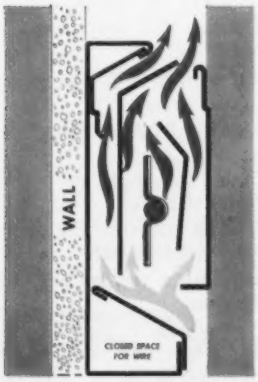
Cavalier improved BASEBOARD with FULLY ENCLOSED ELEMENT

NEW SAFETY Now, Cavalier's Baseboard heating element is **fully enclosed** in tubular steel sheath . . . same type proved so reliable and long-lived on electric ranges. Absolutely no shocks, no burns . . . a Cavalier safety feature that's an extra buying reason for those with children. Maximum surface temperature never exceeds 125° F.—**a Cavalier exclusive feature**—yet heating output is full 200 watts per lineal foot.

EASY ON THE EYE Cavalier is the **architectural** Baseboard with the built-in look that folks want to buy. Keeps new look longer.

COMPLETELY AUTOMATIC ELECTRIC!

The only system ever discovered that puts the heat where it belongs and will make a room comfortable right up to the windows, no matter how large and exposed they are. Reduces window frosting, too.



Vertical fin welded continuously to element sheath helps radiate heat, does not obstruct air flow, Construction eliminates dust traps. Heated air is thrust out into room, away from walls.

SAVE TIME AND MATERIALS Fewer sections required; jobs finished faster. Sections interlock. Only 2 screws per 32" or 48" section needed to fasten to wall. Special build-in convenience outlet sections (duplex 115V), a sales-making feature! Thermostatic control section builds in too. Saves labor and run of wire across room to wall thermostat. No carpentry. Installs on wall surfaces, no recessing.

INDIVIDUAL ROOM TEMPERATURE High quality, liquid-filled thermostat keeps each room at exact temperature desired, independent of other rooms. Zone control at its best! True perimeter heat, perfectly balanced everywhere in the room, at all levels.

TOPS IN EFFICIENCY Installs at floor level along weatherside walls where it's needed most. Takes advantage of natural rising of heat. No moving parts, nothing to wear out or cause trouble. No profit-robbing callbacks! Write for the newest catalog on Cavalier's complete line of Electric Heating Equipment.

CAVALIER • • • the line that stays ahead!

FIRST *in quality construction*
in engineering advances
in safety
in sales making features

OVER 90 YEARS OF QUALITY PRODUCTS

CAVALIER CORPORATION, Electric Heating Division • Chattanooga 2, Tennessee

HIGHWAY SKID-MOUNTED

EARTH-BORING MACHINES

. . . dig the hole . . . . set the pole . . . .

Available on full Swing-Base for curb-side digging or Spotter-Base for easy positioning. Write to Highway for complete information.

Spotter-Base for hydraulic positioning in an 80" arc, in-and-out motion of 22".

10 plus features

1. Designed and built rugged and sturdy for tough daily use.
2. Powerfully made to dig holes up to 36" in diameter and 10 feet deep in any soil conditions.
3. Can be quickly mounted on any type or make of truck having sufficient capacity to carry its weight.
4. Can be equipped with integral winch and derrick with a rated capacity of 4500 pounds.
5. Can be quickly adjusted to dig at many angles regardless of position of truck.
6. Auger bar and pole derrick are raised from traveling to working position by power.
7. A complete earth-boring machine, integrally assembled with engine, clutch and transmission.
8. A new adjustable clutch with side ports in the clutch case affording easy access for adjustment.
9. New winch takes power directly from transmission. Utilizes all speeds of transmission.
10. Optional hydraulic controls for easier, faster operation.

HIGHWAY®

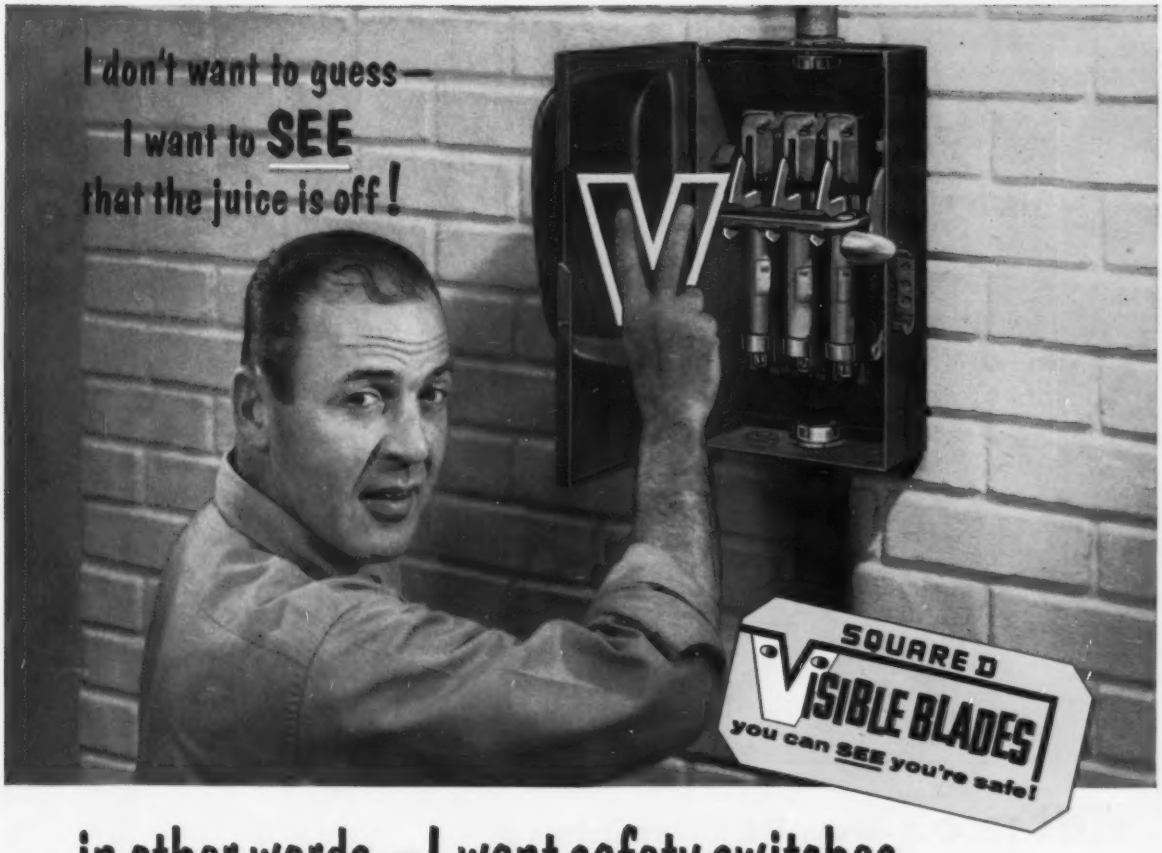
UTILITY DIVISION

HIGHWAY TRAILER COMPANY

HEADQUARTERS: EDGERTON, WISCONSIN

Manufacturers of: Public Utility Bodies • Earth-Boring Machines • Pole and Cable Reel Trailers • Winches • Power Take-offs • Service Accessories • Commercial Trailers • Trailerized Tanks and Dry Bulk Haulers

SALES AND SERVICE IN PRINCIPAL CITIES



...in other words—I want safety switches with VISIBLE BLADES!

The men who pull the switches will tell you what can happen when a switch, *believed* to be open—*isn't*. A lot of things can happen—and every one of them is bad. Personnel is in danger. Motors can single-phase. Machinery and work can be damaged. Down-time can skyrocket.

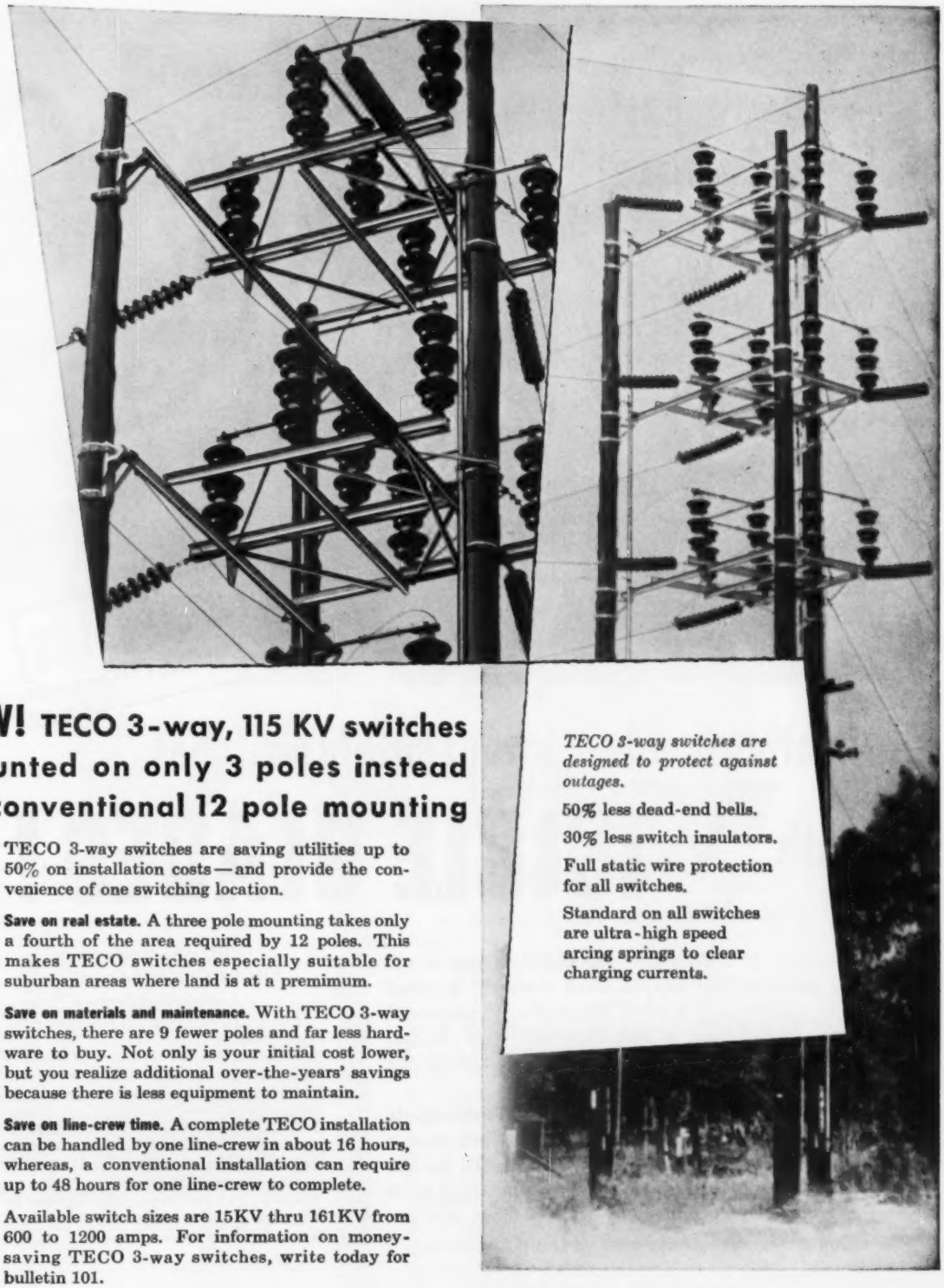
Doesn't it make sense to insist on Visible Blade construction which gives you a road block against any of these possibilities? Doesn't it make equally good sense to insist on the safety switch which gives you that construction—plus a lot of other performance advantages?

100,000-ampere SHORT CIRCUIT Capacity
—Another Plus Feature

Square D safety switches equipped with high capacity current limiting fuses provide full protection on even the highest electrical loads. Independent tests by a high capacity laboratory on Square D safety switches—rated at 30 through 600 amperes—subjected the switches to both open and closed tests on 100,000 ampere short-circuited systems. *Not one Square D switch showed any sign of failure!* Further proof that Square D switches provide *plus* safety. They cost no more—why settle for less?

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY



NEW! TECO 3-way, 115 KV switches mounted on only 3 poles instead of conventional 12 pole mounting

TECO 3-way switches are saving utilities up to 50% on installation costs—and provide the convenience of one switching location.

Save on real estate. A three pole mounting takes only a fourth of the area required by 12 poles. This makes TECO switches especially suitable for suburban areas where land is at a premimum.

Save on materials and maintenance. With TECO 3-way switches, there are 9 fewer poles and far less hardware to buy. Not only is your initial cost lower, but you realize additional over-the-years' savings because there is less equipment to maintain.

Save on line-crew time. A complete TECO installation can be handled by one line-crew in about 16 hours, whereas, a conventional installation can require up to 48 hours for one line-crew to complete.

Available switch sizes are 15KV thru 161KV from 600 to 1200 amps. For information on money-saving TECO 3-way switches, write today for bulletin 101.

TECO 3-way switches are designed to protect against outages.

50% less dead-end bells.

30% less switch insulators.

Full static wire protection for all switches.

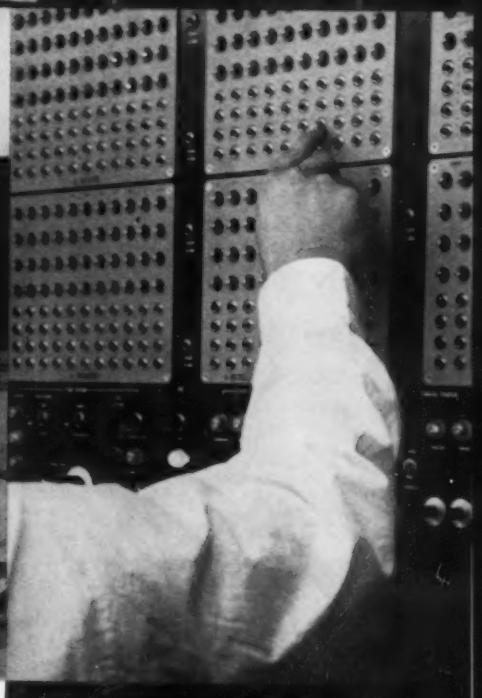
Standard on all switches are ultra-high speed arcing springs to clear charging currents.

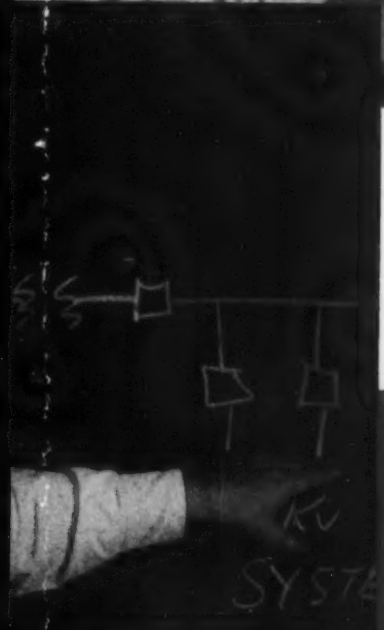
TURNER ELECTRIC CORPORATION

9500 ST. CLAIR AVE. EAST ST. LOUIS, ILLINOIS

Complete Line of Air Break Switches • Flexi-Band and thru Bolt Cluster Transformer Mounting Brackets • Dead-End Band Brackets

Fluor's Datatron digital computer frees engineers from routine computation, permitting full use of their creative design talents. Its ability to quickly perform intricate calculations without error shortens engineering lead time . . . assures maximum precision and efficiency in completed plants.

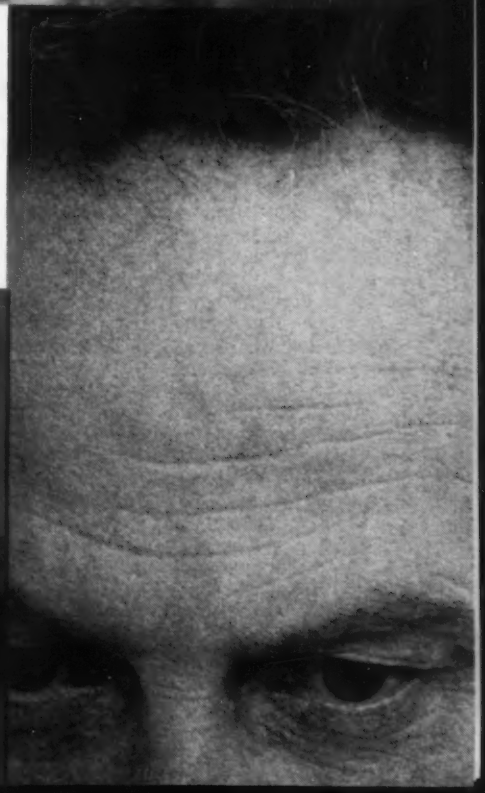




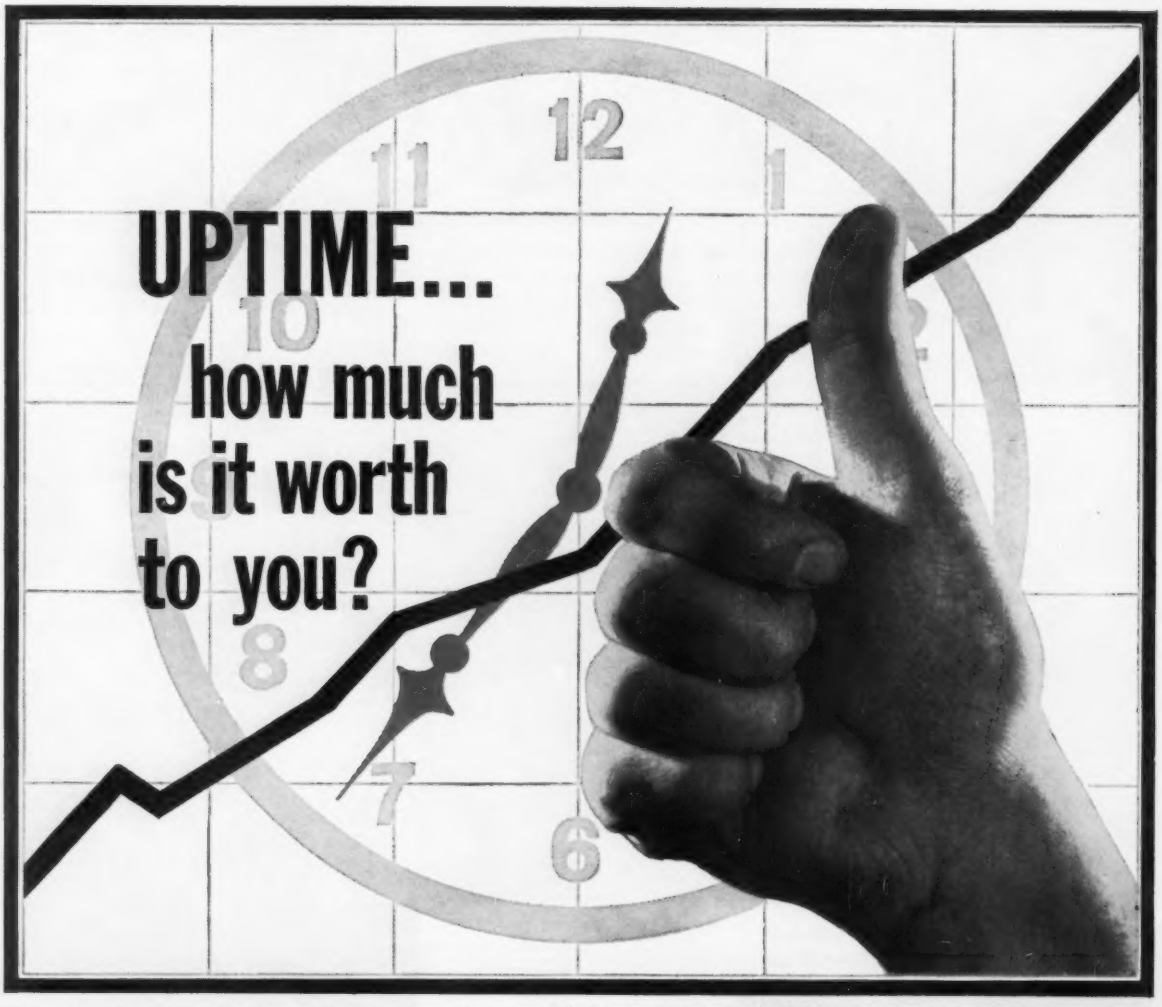
WHEN you consider expansion...
the most important investment
you can make is in
the creative ability of men.

FLUOR

The Fluor Corporation, Ltd.
Engineers & Constructors
2500 S. Atlantic Blvd., Los Angeles



US RUBBER PACKING



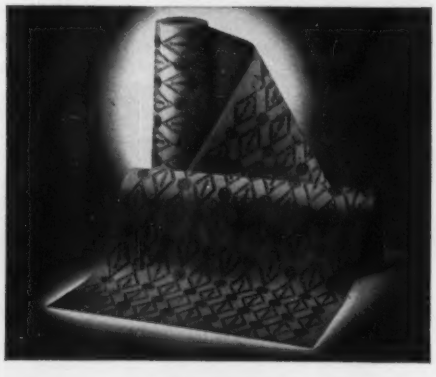
These days, everyone talks about *downtime costs*. Few consider how much *uptime is worth*—the great majority of time when production runs smoothly. How much is uptime worth to *you*, each hour? $100–$200–$300?

And how much are you willing to spend each hour for a packing that will help keep your pumps and flow lines maintenance free? 1¢–2¢–5¢?

That's the kind of money involved when you use a packing like U. S. Rainbow®—first in red sheet packing. Each extra hour of production uptime means hundreds of dollars in production, yet those same extra hours of packing uptime can be had for just pennies... the difference in cost between a quality packing like U. S. Rainbow and ordinary packings.

Rainbow is designed to pack flanges or other parallel surfaces against hot or cold water, air, saturated steam (up to 150 lbs.) and many other hydraulic conditions—and to pack them for longer hours of *uptime*.

When you think of rubber, think of your "U. S." Distributor. He's your best on-the-spot source of technical aid, quick delivery and the finest quality industrial rubber products.



US RUBBER

Mechanical Goods Division

United States Rubber

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N.Y. In Canada: Dominion Rubber Company, Ltd.

DEAD END WITH

BLACKBURN

W6-2A from 6 Sol to 2 ACSR
This Clamp Will Handle All Popular Service Drop Wires

WEDGE CLAMPS

For Light Service
W6-4A
6 Sol to 4 ACSR

For Heavy Service
W2-OA
2 Sol to 1/0 ACSR

Conductor in contact with wedge for entire length of slider.

Removable aluminum slider allows installation without threading through clamp.

Drop wire can be pre-sagged and cut to exact length needed.

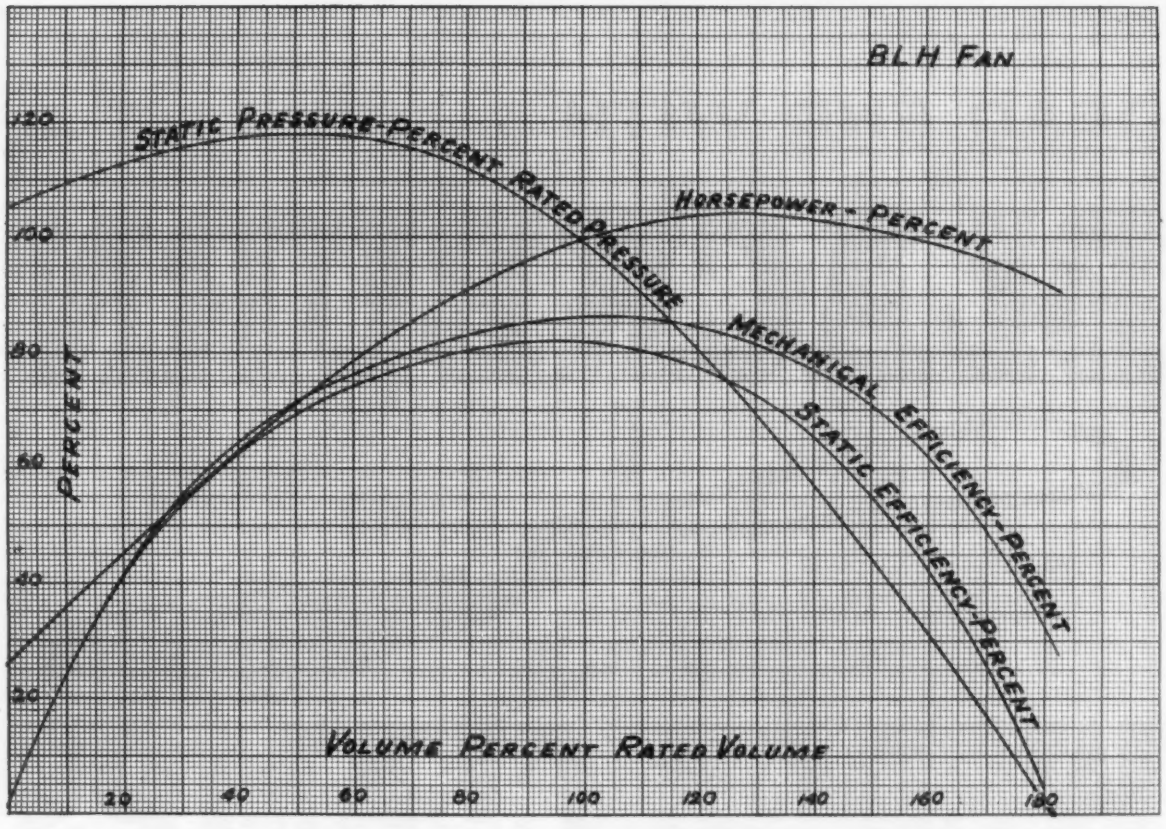
Can be attached to bare neutral at any point in the span.

Your Choice of 3 Bails

STANDARD **FLEXIBLE CAPTURED** **FLEXIBLE FREE**

JASPER BLACKBURN CORPORATION

1525 Woodson Rd., St. Louis 14, Mo., Wydown 3-9430



When Mechanical Draft Specs meet them with "BUFFALO"

To enjoy the efficiency benefits of the "BLH" in Classes III and IV mechanical draft installations, contact your nearest "Buffalo" representative — or write for Bulletin F-200.

"BLH"—For Classes III & IV Mechanical Draft Service

The "Buffalo" Type "BLH" Fan is specifically designed to deliver peak efficiency, dependability and serviceability for Classes III and IV mechanical draft requirements. The "BLH" maintains its high mechanical efficiency of 86% over an extremely broad operating range. The "BLH" insures a constant stability of performance from free delivery to shutoff. Many unusual design features contribute to the smooth, quiet, powerful operation of the "BLH". A smooth inlet bell, directional inlet vanes, backward curved blades, specially curved rotor flange and divergent outlet reduce turbulence to an absolute minimum.

You'll appreciate the "Q" Factor in all "Buffalo" Fans — the built-in

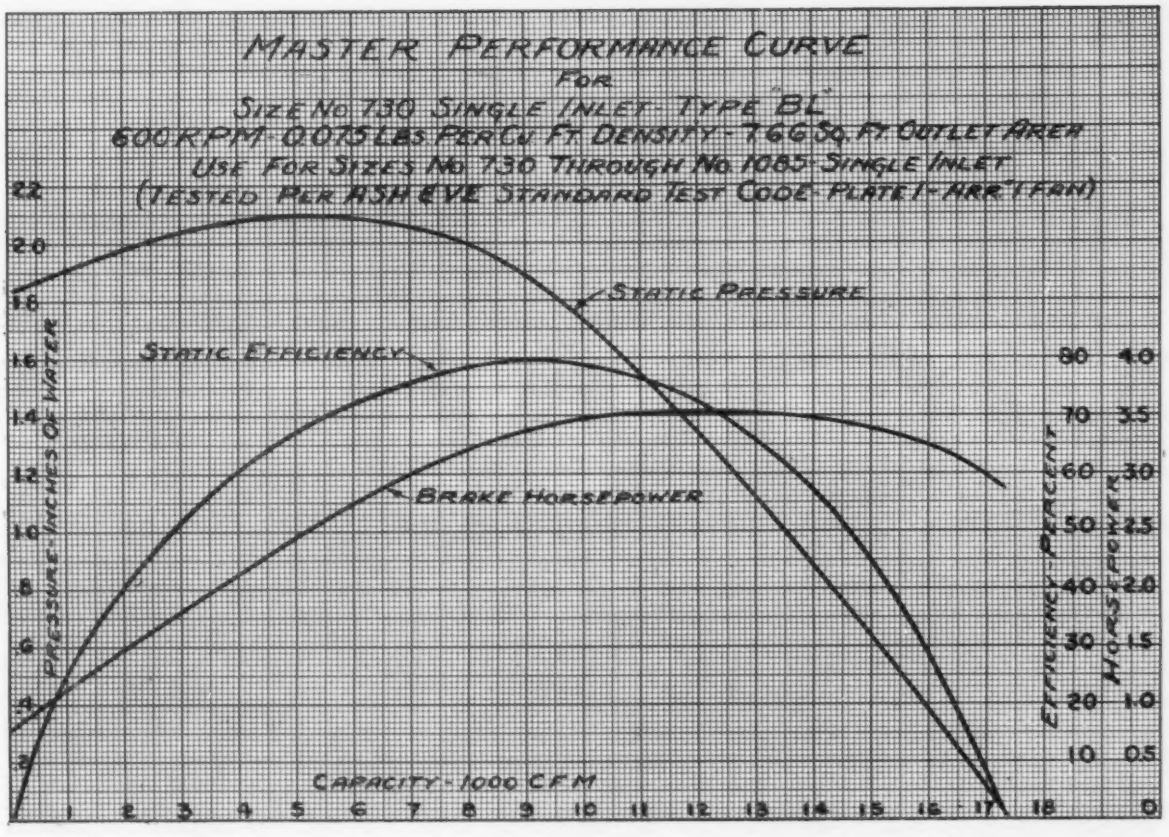
"Buffalo"

BUFFALO

BUFFALO,

Canadian Blower and Forge

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING


MASTER PERFORMANCE CURVE
FOR
SIZE NO. 730 SINGLE INLET - TYPE "BL"
600 R.P.M. - 0.075 LBS. PER CU. FT. DENSITY - 7.66 SQ. FT. OUTLET AREA
USE FOR SIZES NO. 730 THROUGH NO. 1065 SINGLE INLET
(TESTED PER A.S.H.&V.E. STANDARD TEST CODE - PLATE I - ARR'T. FAN)
STATIC PRESSURE
STATIC EFFICIENCY
BRAKE HORSEPOWER
PRESSURE - INCHES OF WATER
EFFICIENCY - PERCENT
HORSEPOWER
CAPACITY - 1000 C.F.M.

call for flexible fan performance types "BL" and "BLH" fans

"BL"—For Classes I & II Mechanical Draft Service

The "Buffalo" Type "BL" Fan will provide superior performance for most mechanical draft requirements in Classes I & II. Of non-overloading design, the "BL" insures quiet, stable output from free delivery to shutoff. The high operational efficiency of the "BL" is directly due to several unique design features. Minimum turbulence is a result of the smoothly curved inlet bell with directional guide vanes. Among other outstanding "BL" features are the correctly-designed wheel, tested and balanced at the factory to keep vibration to a minimum, and the specially shaped scroll of the "Wheel-matched" housing.

Quality which provides trouble-free satisfaction and long life.

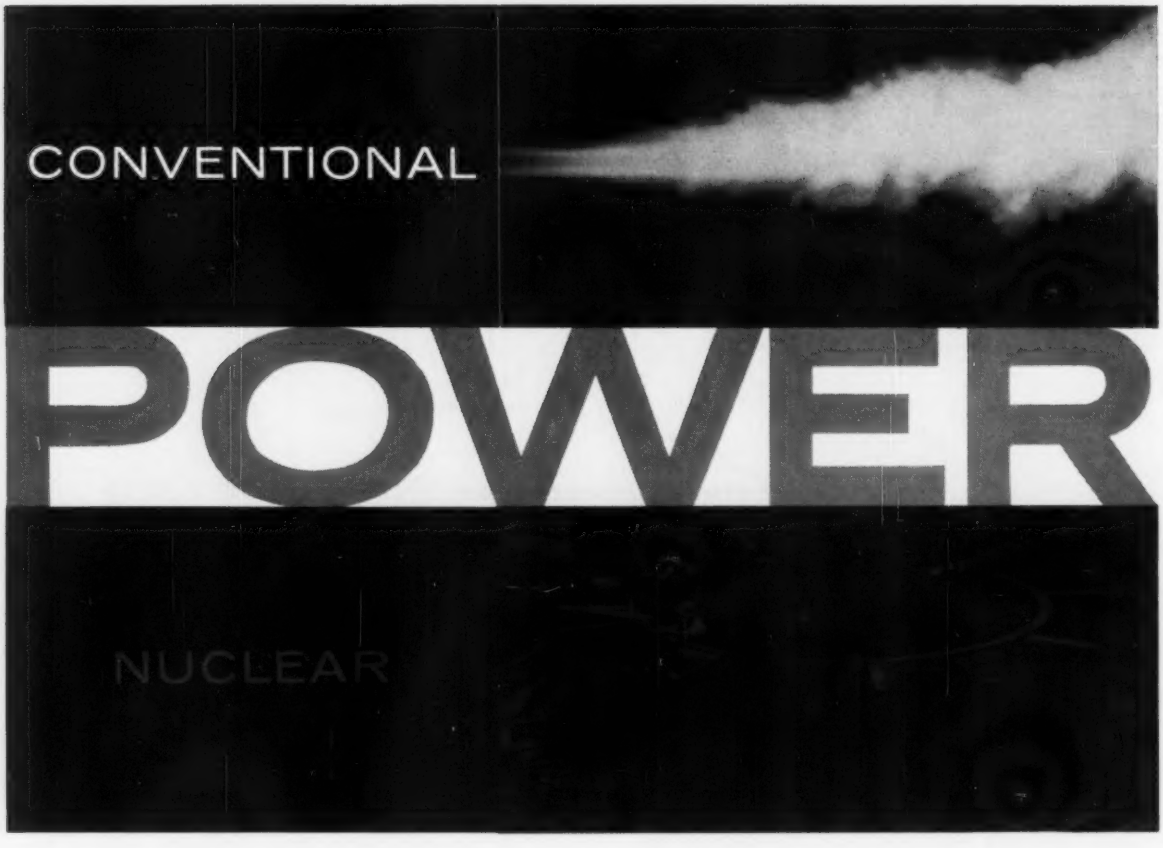
For top performance under general requirements in Classes I and II mechanical draft service, ask your nearest "Buffalo" representative about the "BL" Fan, or write today for Bulletin F-102.

FORGE COMPANY

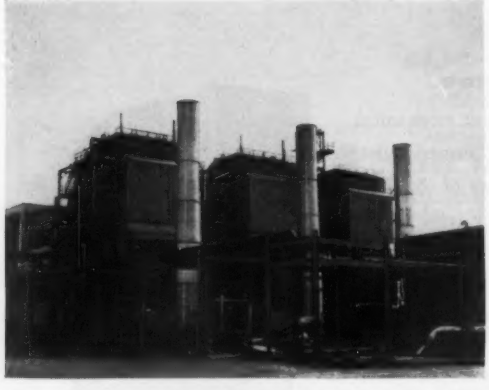
NEW YORK

Co., Ltd., Kitchener, Ont.

FORCED DRAFT COOLING HEATING PRESSURE BLOWING



Kaiser Engineers can design and build you a better power plant, sooner, for less.



960,000 pounds/hour steam generator plant producing process steam, compressed air and 31,250 KW of electricity for alumina plant. Designed and built by KE.

A 475,000 KW power plant in Louisiana. America's Engineering Test Reactor in Idaho. A 100,000 KW industrial steam power plant in Pennsylvania. The engineering study for the AEC's Gas Cooled Graphite Moderated Power Reactor. A $10,000,000 dual-purpose process steam and power plant. New nuclear development projects in Europe, Asia and Latin America. This is Experience—electric power from both nuclear and fossil fuels. To which Kaiser Engineers couples Ingenuity to pioneer, to develop new methods, to achieve better plants, quicker, for less. For experience, ingenuity, and a cost conscious approach, call or write KE. Today.

KAISER ENGINEERS

KAISER ENGINEERS engineers-contractors
Contracting since 1914

Division of Henry J. Kaiser Company • Oakland 12, California • New York, Pittsburgh, Washington, D. C., Buenos Aires, Calcutta, Dusseldorf, Montreal, Rio de Janeiro, Sydney, Tokyo

There's a good reason WHY...

ALLIS-CHALMERS uses

SPECIAL EQUIPMENT IN WELDING

distribution transformers

EXTRA ASSURANCE of long, dependable service

SPECIAL tank positioners permit Allis-Chalmers welders to use the down-hand method in electric arc welding. This results in better welding accuracy and quality, guarantees strong, oiltight tanks. Closely controlled welding temperatures, expertly calculated weld sizes and fillets, pressure testing of all tanks after welding, add further assurance of quality. This is but one of the many reasons why Allis-Chalmers distribution transformers last longer, perform better with far less maintenance.

For all the good reasons why Allis-Chalmers transformers are superior, ask your A-C man. Or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-5720

NOW...

double barreled performance

WITH THE ALL NEW AMP UTILI-TAP TEAM

The unique double barreled UTILI-TAP connector and matchmated tools offer a completely new and easy way to secure conductors at both ends of the service drop, at transformers and loop splices. No loose-piece hardware to fumble with, no periodic tightening or arm-wearying tooling. The UTILI-TAP team means maximum performance and long life, with greatest ease of application.

The UTILI-TAP Connector features:

- exclusive double barreled **locking crimp**—to guard against relaxation under varying load conditions
- **tin-plated** to resist corrosion and assure optimum electrical connection
- **pre-inhibited** with non-flow compound to remove oxide from aluminum conductors

The UTILI-TAP Tool features:

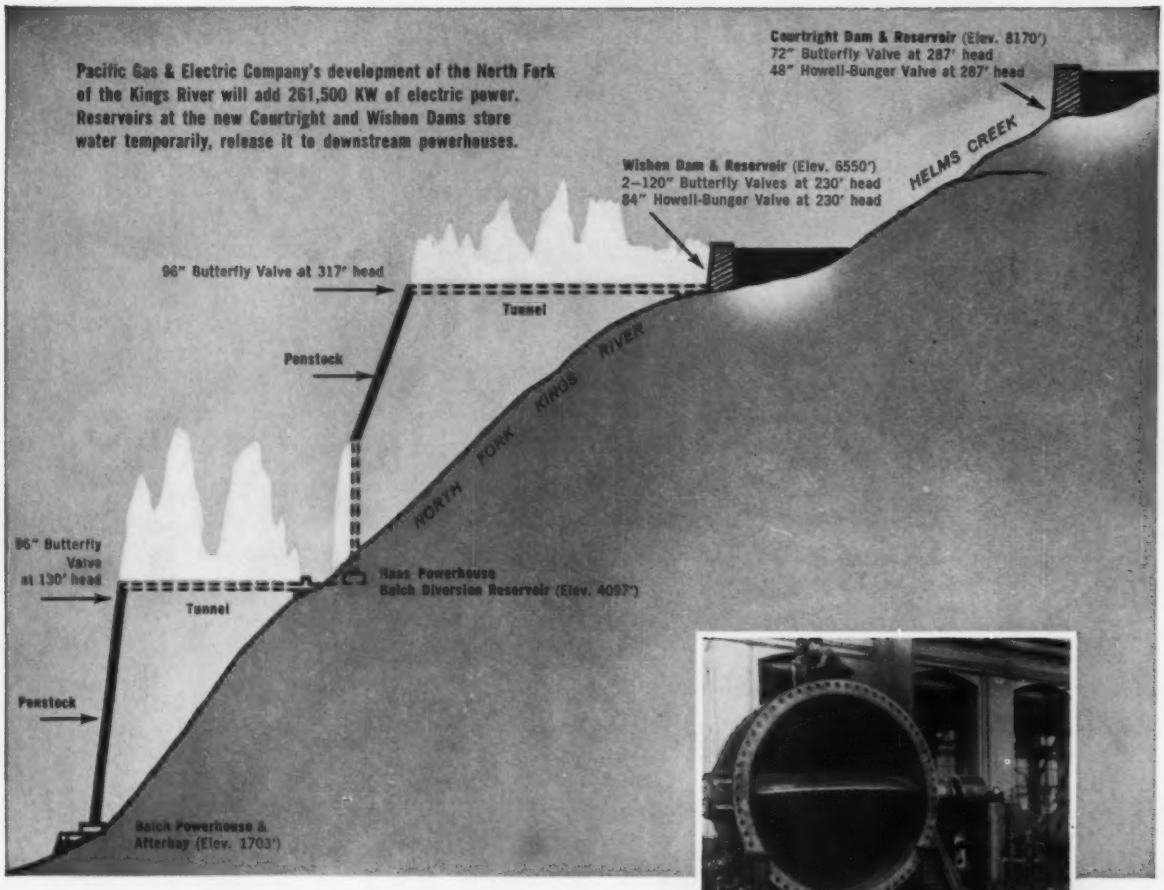
- crimping dies are permanently attached to tool head for quick die change
- open type head for easy access to conductor and quick release after application
- portability—lightweight (less than 8 lbs.)
- for wire size range 8 through 4/0 AWG—solid, stranded and ACSR—in all copper and aluminum wire combinations

For more information on the double barreled UTILI-TAP method, write:

American Pamcor, Inc.

GENERAL OFFICES: 181 HILLCREST AVE., HAVERTOWN, PA.

EXCLUSIVE DISTRIBUTORS FOR AMP PRODUCTS TO THE UTILITY INDUSTRY

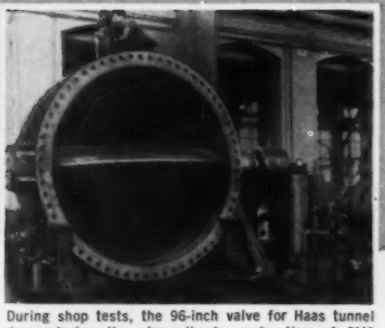

Pacific Gas & Electric Company's development of the North Fork of the Kings River will add 261,500 KW of electric power. Reservoirs at the new Courtright and Wishon Dams store water temporarily, release it to downstream powerhouses.
Courtright Dam & Reservoir (Elev. 8170')
72" Butterfly Valve at 287' head
48" Howell-Bunger Valve at 287' head
HELMS CREEK
Wishon Dam & Reservoir (Elev. 6550')
2—120" Butterfly Valves at 230' head
84" Howell-Bunger Valve at 230' head
96" Butterfly Valve at 317' head
Tunnel
Penstock
NORTH FORK KINGS RIVER
86" Butterfly Valve at 130' head
Tunnel
Haas Powerhouse
Balch Diversion Reservoir (Elev. 4097')
Penstock
Balch Powerhouse & Afterbay (Elev. 1703')

Kings River Project installs SMS valves

Five SMS Butterfly Valves and two SMS Howell-Bunger Valves are being installed by Pacific Gas & Electric Company on its Kings River hydropower project in the Sierra and Sequoia National Forests. They will control the flow of water from upstream reservoirs to the powerhouses in this $80 million system.

Seals on SMS Butterfly Valves cut leakage to a minimum. Disc and body seals are adjustable from either inside or outside, as specified. Specially-developed SMS trunnion seals are essentially drop-tight. Welded discs and housings assure freedom from the defects of cast materials, and permit more economical construction.

SMS Butterfly Valves have been designed and built in diameters up to 18 feet, and for service with operating heads up to 750 feet. To obtain information on SMS hydraulic turbines, valves and other accessories, write to S. Morgan Smith Company, York, Penna.



During shop tests, the 96-inch valve for Haas tunnel demonstrates the streamlined construction of SMS welded steel plate discs. This reduces head loss and turbulence to a minimum.

One of the 120-inch Wishon Reservoir valves on the SMS assembly floor shows adjustable seals on the discs and recess for the renewable seal ring within the body.

S. MORGAN SMITH

HYDRODYNAMICS

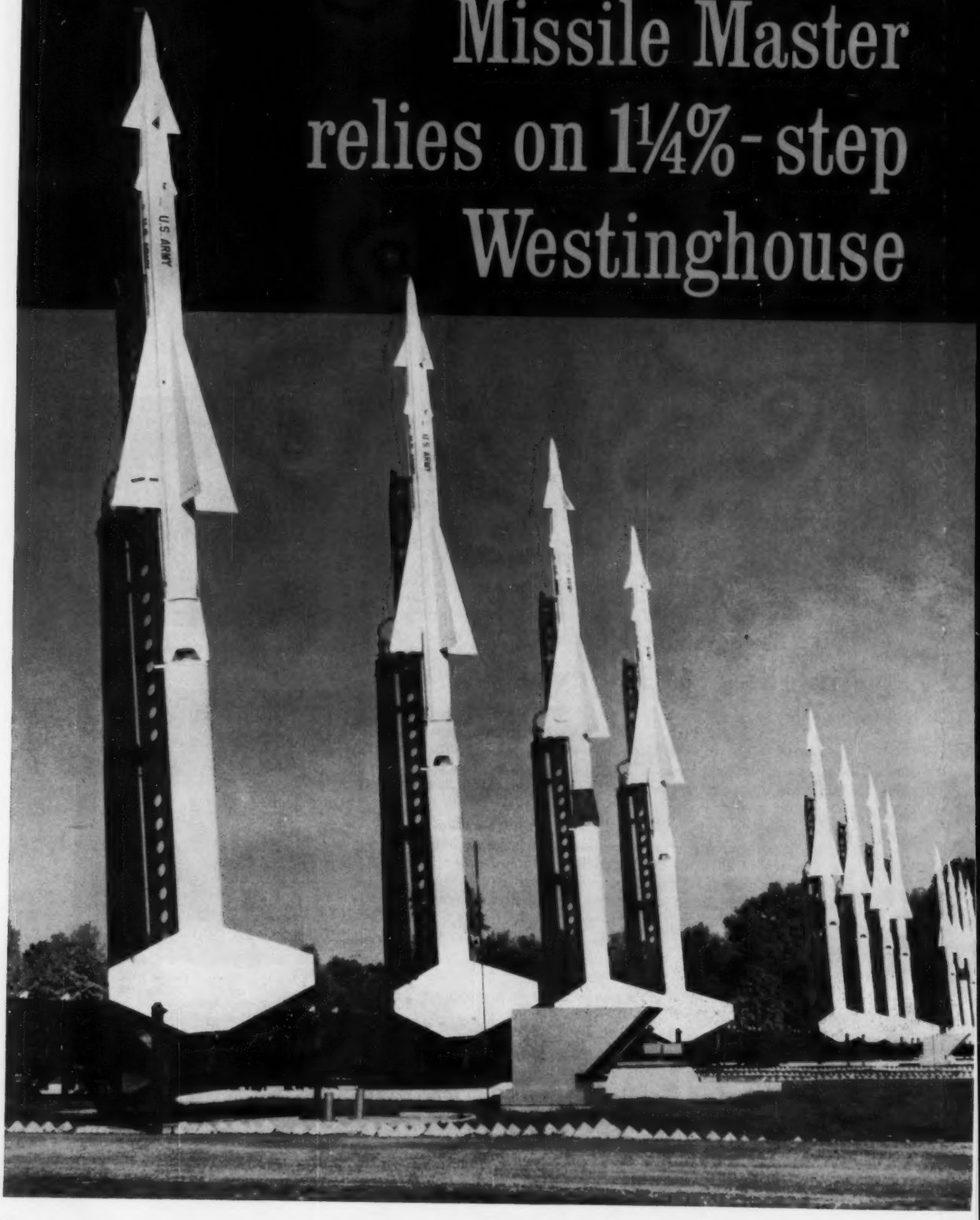
More Power To . . .

AFFILIATE: S. MORGAN SMITH, CANADA, LIMITED, TORONTO

Rotovalves • Ball Valves • R-S Butterfly Valves • Free-Discharge Valves • Liquid Heaters • Pumps • Hydraulic Turbines & Accessories

PROTECTING THE BALTIMORE-WASHINGTON AREA...

Missile Master relies on 1¼%-step Westinghouse



NIKE control system regulation of URL regulators

Missile Master, the first fully operational electronic air defense control system in the United States, now protects the Washington-Baltimore government-industry complex against air attack. Located at Fort George G. Meade, Maryland, Missile Master combines the latest automatic electronic equipment with human supervision at critical points.

Playing an important part in the functioning of the Missile Master installation are 30 Westinghouse URL voltage regulators. The URL combination of 1¼% steps, inverse time delay relay and instant response tap changer keeps voltages constant and reliable.

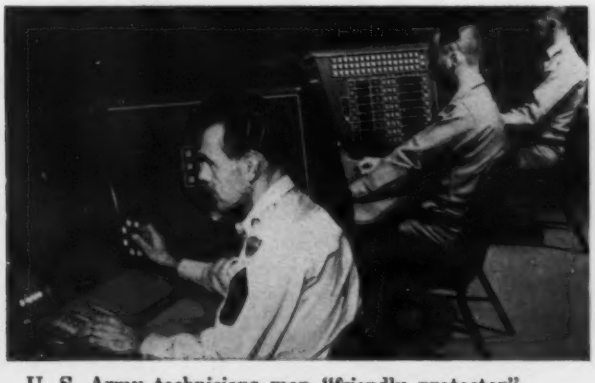
Developed by the U.S. Army Signal Corps Engineering Laboratories at Fort Monmouth, New Jersey, in conjunction with The Martin Company, of Orlando, Florida, this electronic system will control and coordinate the fire of the Army's air defense weapons to insure their maximum effectiveness.

The Missile Master collects information on the location and identity of aircraft, presents this information on electronic displays and distributes this data to the missile firing batteries. Thus, each NIKE battery receives continuous data on all aircraft within the defense area, and on the activities of other batteries. Each NIKE battery commander receives the information needed for proper target selection.

Ask your Westinghouse representative how this same reliability (from either URL or URF voltage regulators) can aid your power distribution system . . . can keep your voltages constant . . . can help you carry greater loads and produce more revenue. Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J 70891

YOU CAN BE SURE...IF IT'S Westinghouse

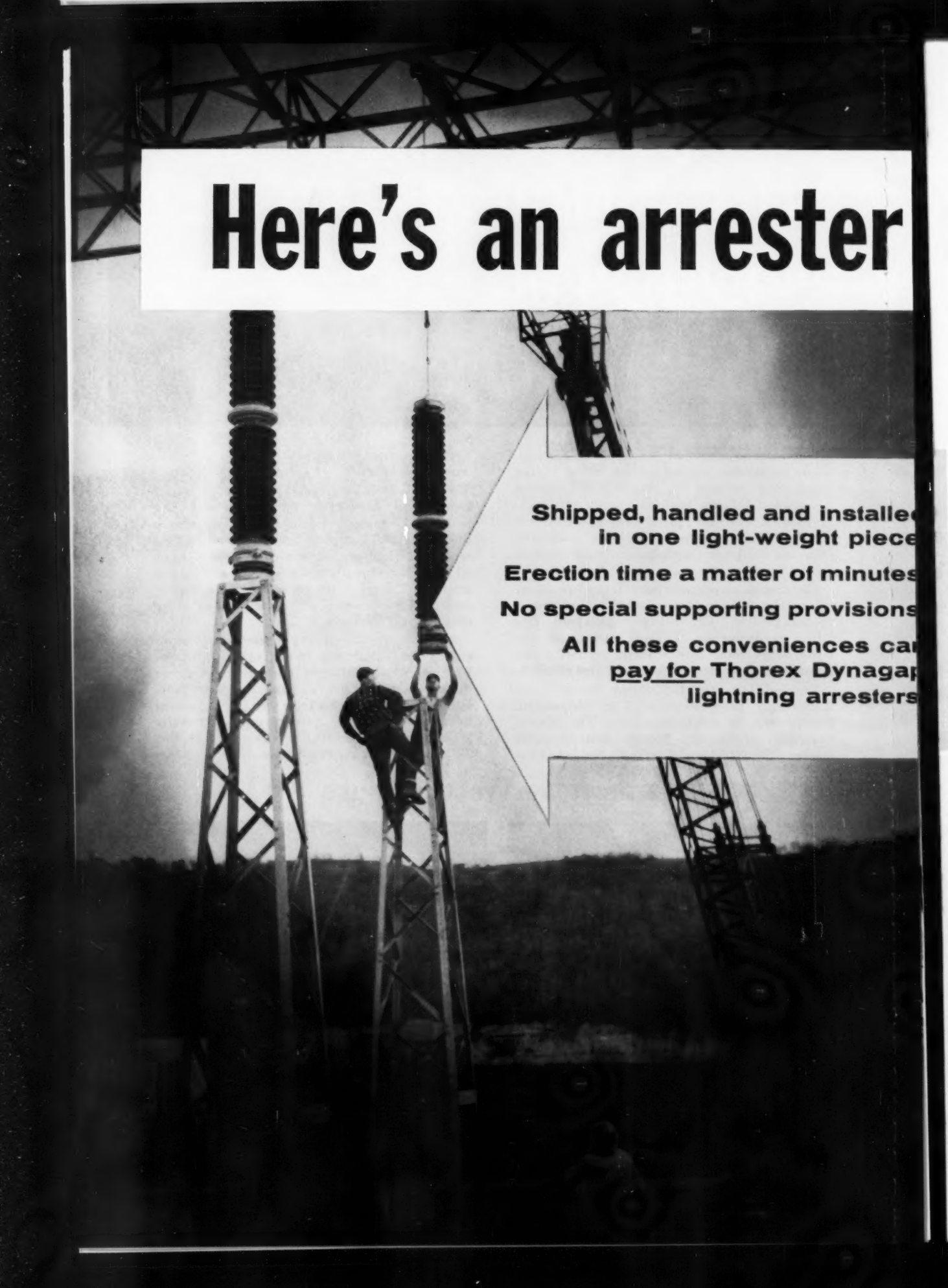
Mr. L. J. Huettel, Westinghouse representative, and Mr. B. J. Klaasen, of The Martin Company, inspect one of thirty Westinghouse URL regulators which supply reliable voltage to the Missile Master defense system.



U. S. Army technicians man "friendly protector" console, insuring that friendly aircraft are not fired upon by our missile batteries.

A typical NIKE Ajax Surface-to-Air guided missile launching site.

Here's an arrester



Shipped, handled and installe
in one light-weight piece

Erection time a matter of minutes

No special supporting provisions

All these conveniences ca
pay for Thorex Dynagap
lightning arresters

paying for itself !

This is a Thorex Dynagap arrester for 345 kv - - biggest made. It took *two or three minutes* to move from the shipping crate to the pedestal. More popular sizes, 138 or 230 kv for example, go up even quicker!

Same support can be used for an insulator stack or this arrester. Sizes and weights are comparable. Some handy arrester locations may be found right within station steelwork on this account.

A hoist and one or two men are the total installation crew. Construction cost for such an important piece of equipment is almost negligible, since it is handled entirely in one piece.

And, when it's in place, the Thorex Dynagap lightning arrester will provide a whole new order of station protection and surge durability.

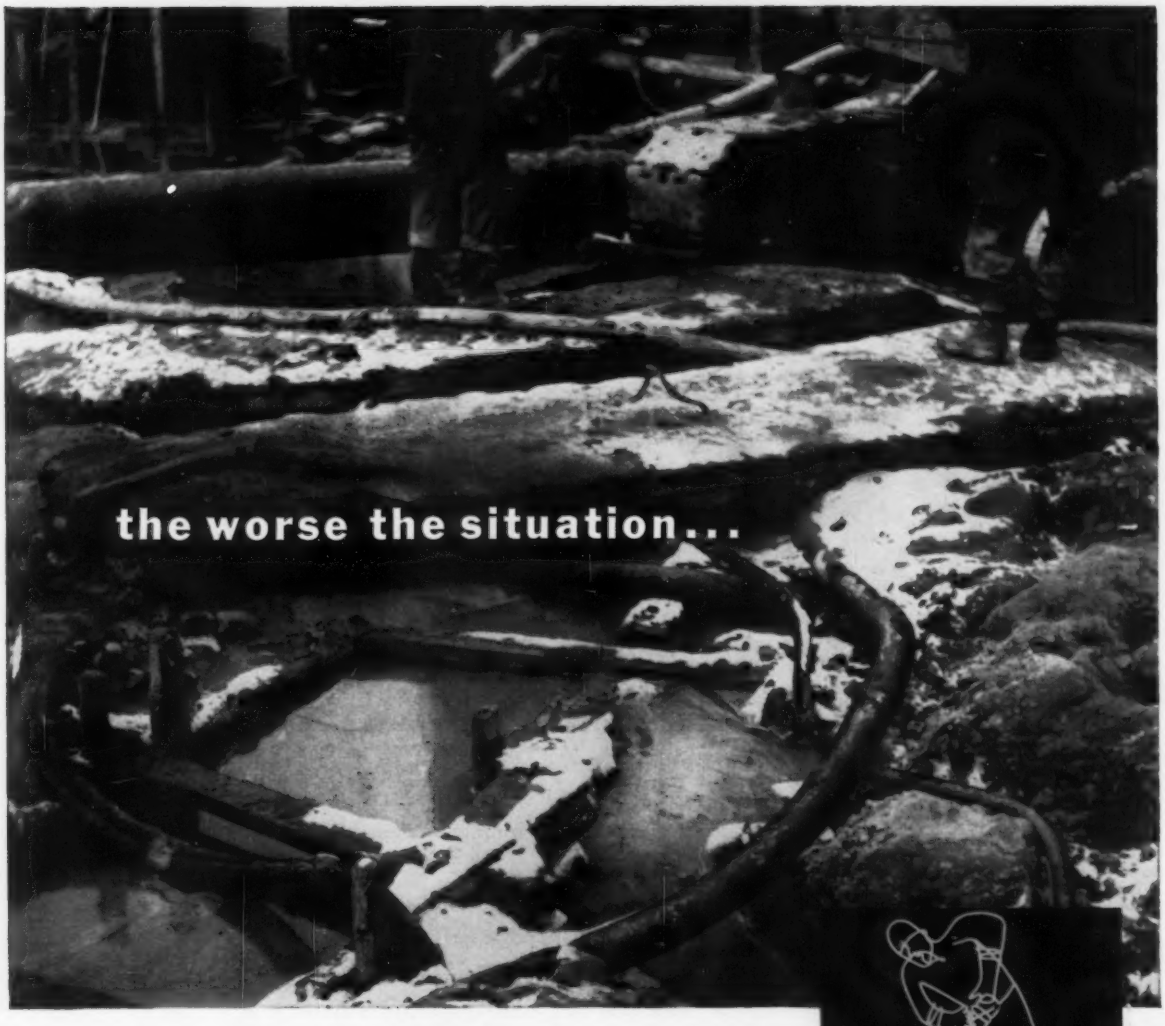
Take its sensible first cost - - then consider comparable construction economies - - and this arrester can go a long way toward *paying for itself.* It is by far your best buy from any standpoint.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass

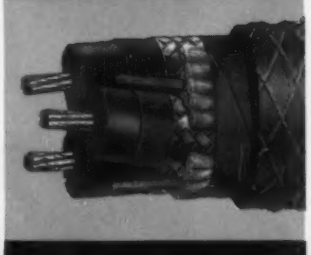
4913-H

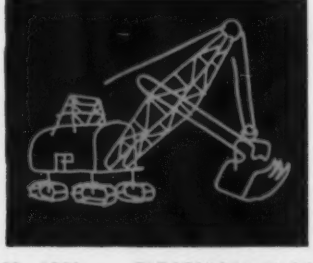


the more reason for using TIREX®

TIREX cords and cables give longest service when not subjected to severe abuse. But when required, TIREX can take it. In snow and mud, under water and under pressure, TIREX cords and cables remain flexible, smooth, light and easy to handle, thanks to their original cured-in-lead construction. They won't snag or tear, and their fortified and tempered neoprene armor gives balanced resistance to abrasion, water, acids, oils, sunlight and flame.

Millions of feet of TIREX are on the job everywhere—transmitting power for mobile mining equipment, construction machinery and portable tools.





Simplex WIRE & CABLE COMPANY

79 SIDNEY STREET, CAMBRIDGE 39, MASS.

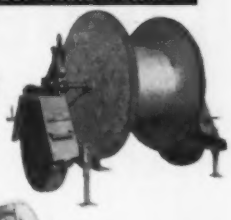
"The American manufacturers of transoceanic telephone cables"

PENGO Job-Proved Tension-Stringing Equipment

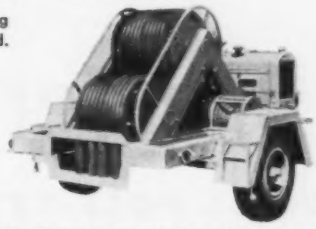
Manufactured by the makers of the World Famous PENGO Earth Auger

NOTE: More than 40 models of PENGO Tension-Stringing equipment models are available for every stringing need.

PENGO Bullwheel Cable Pullers

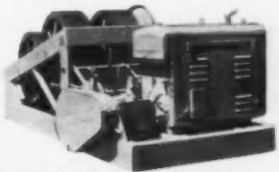


MODEL 6100 TC-RW Reel Winder.



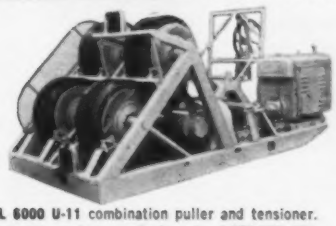
MODEL 5700-II, trailer mounted, pulls one or two conductors or pulling lines. Tensions to 4,000 lbs. Use with PENGO 6100 TC-RW Reel Winder.

MODEL 6700-I, trailer mounted, pulls one conductor or pulling line. Tensions to 12,000 lbs. Use with PENGO 6100 TC-RW Reel Winder.

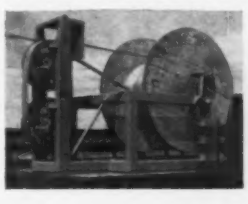


MODEL 6700-II, skid mounted, pulls one or two conductors or pulling lines. Tensions to 12,000 lbs. Use with the 6100 TC-RW Reel Winder.

PENGO Tensioners



MODEL 6000 U-11 combination puller and tensioner. Handles one or two conductors to 1,272,000 CM.



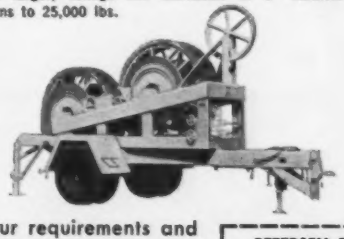
MODEL 5000 S-I strings one conductor to 556,000 CM. Tensions to 2000 lbs., takes reels to 44" x 72".

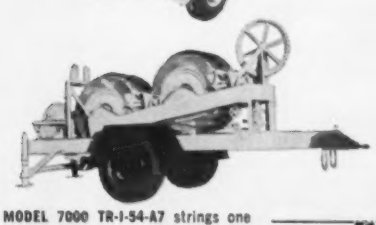
MODEL 5000 TR-II strings one or two conductors to 556,300 CM. Tensions to 1500 lbs. per conductor. Designed for very rough country work as well as general use; use with separate reel-carrying dolly or PENGO 6100 CT-RW.

MODEL 6000 WS-TR strings one or two conductors to 1,272,000 CM. Tensions to 5000 lbs. per conductor. Complete trailer unit with reel-carrying devices, for general and medium-rough country use.

MODEL 6000 XHD-TR-I-A6 shown with snubbing brake. Strings one conductor to 1,272,000 CM. Tensions to 10,000 lbs.

(Below) **MODEL 7000 TR-I-72** (similar to 6000 XHD-TR-I, except larger) strings one conductor to 2" diameter. Tensions to 25,000 lbs.





MODEL 7000 TR-I-54-A7 strings one conductor to 2" diameter. Tensions to 25,000 lbs. Extra sturdy, with 54" Bullwheels for low center of gravity – ideal for mountainous terrain.

List your requirements and send for descriptive literature and prices.

PETERSEN ENGINEERING CO., INC.
Santa Clara, California

Other PENGO Products

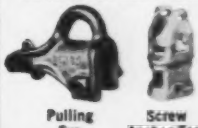
Heavy Duty Double Helix Augers

Extra Heavy Duty Flight Augers (shown with gravel guards)

Offset Boring Heads

Heavy Duty Offset Boring Heads

Screw Bits for Small Holes



Pulling Eye — Screw Anchor Tool

Pole and Transformer chariot

PETERSEN ENGINEERING CO., INC.
Santa Clara, Calif. Dept. G9
Please send PENGO Tension-Stringing equipment data to:

NAME:_____

FIRM:_____

ADDRESS:_____

CITY_____ STATE_____

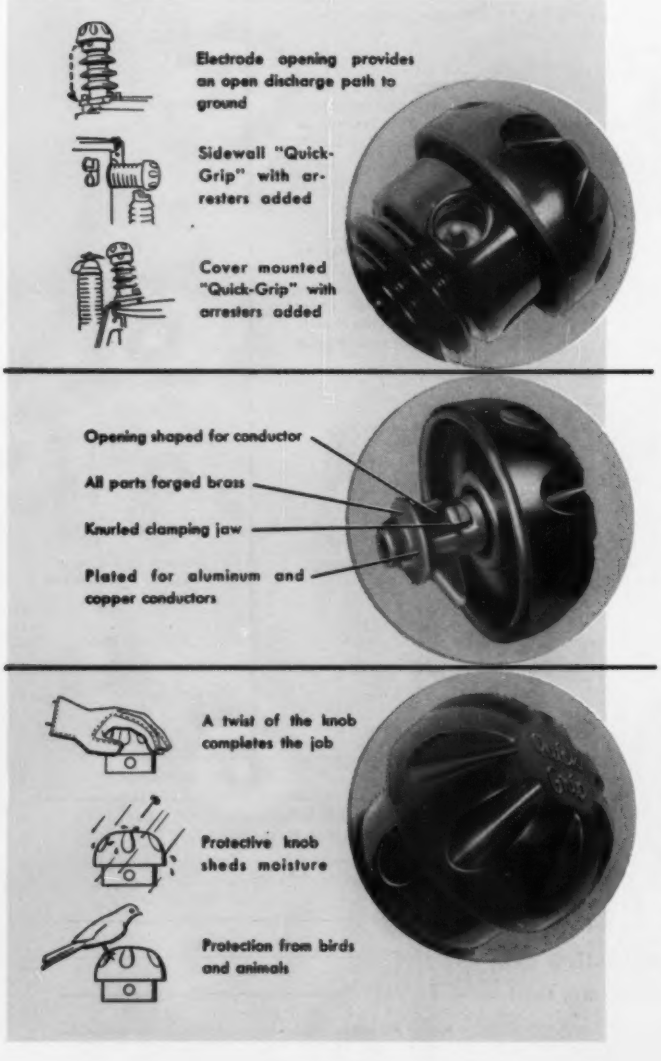
NOW! One Terminal Design

FOR ALL POLE-TYPE TRANSFORMER HIGH VOLTAGE CONNECTIONS

"Quick-Grip" insulated high voltage terminals are standard on all Kuhlman pole-type transformers at no extra cost.

The "Quick-Grip" terminal is by no means new to the industry. First introduced by Kuhlman in 1939, it is universally used today as the fastest, most convenient method for making sidewall line connections. Now Kuhlman, exclusively, offers the same feature in cover mounted designs.

Two years of field service and customer acceptance have proven "Quick-Grip's" versatility in meeting all pole-type transformer high voltage requirements. Here, basically, is how this feature gives all around service and protection for both sidewall and cover mounted bushings.


Electrode opening provides an open discharge path to ground
Sidewall "Quick-Grip" with arresters added
Cover mounted "Quick-Grip" with arresters added
Opening shaped for conductor
All parts forged brass
Knurled clamping jaw
Plated for aluminum and copper conductors
A twist of the knob completes the job
Protective knob sheds moisture
Protection from birds and animals

Built-in Electrode

When arresters are mounted on the transformer, "Quick-Grip's" built-in electrode forms a discharge gap to the arrester terminal. When arresters are not physically mounted on the transformer, the electrode can spill over any abnormal discharges to ground without damage to the bushing, assembly, or knob.

Accommodates Aluminum or Copper Conductors

The terminal conductor opening is shaped to minimize cable deformation and provide maximum contact surface. Knurled clamping jaw applies a firm clamp on either solid or stranded wire and compensates for any relaxation in conductor stresses.

All parts are forged brass to assure greater strength. Clamping parts are plated to eliminate harmful oxidation.

Both cover and sidewall mounted designs accommodate either copper or aluminum conductors.

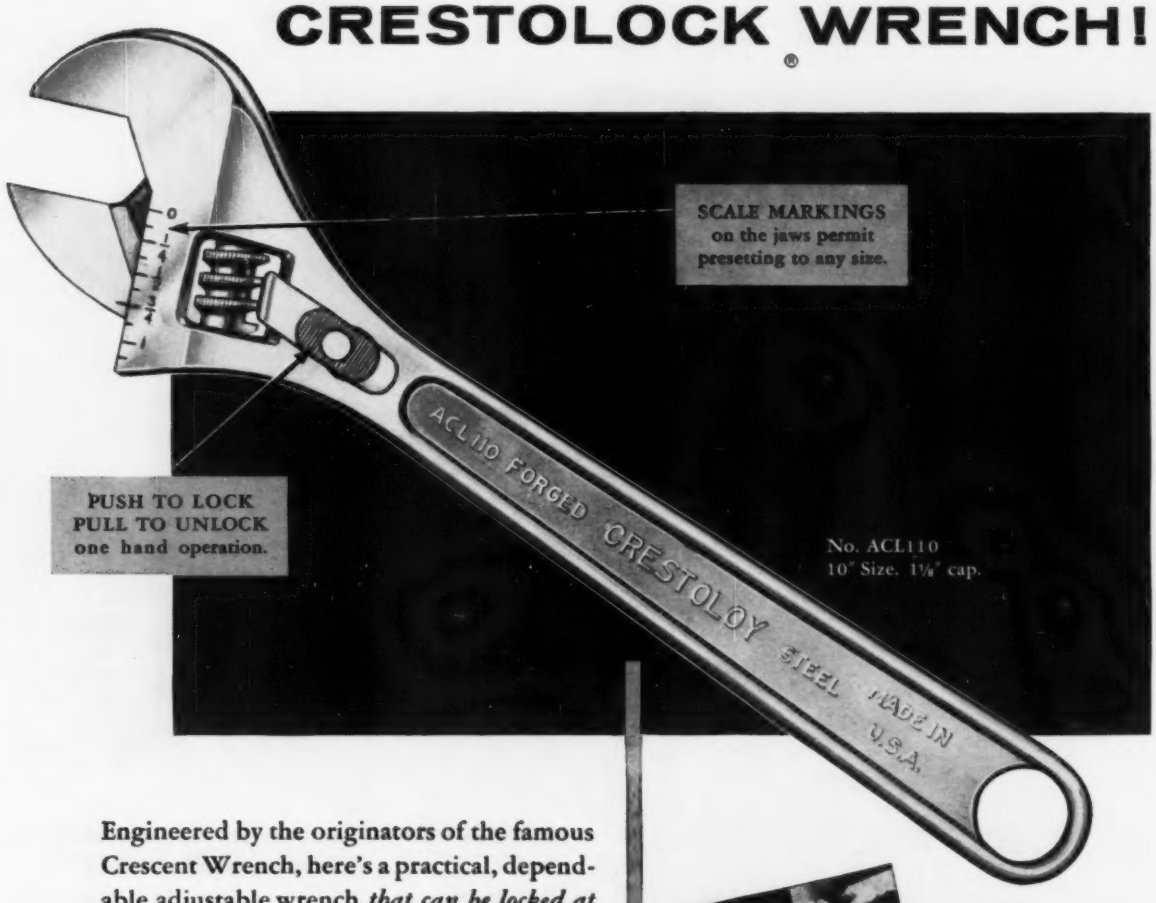
Greater Convenience, More Protection

The big convenient hand grip provides an easy, quick means for connecting the line without tools. A permanent connection is simply made by hand-tightening the knob.

The knob's oversize overhang umbrellas the terminal assembly, sheds water, and keeps dirt and moisture away from the terminal parts. It serves as an insulator as well and eliminates accidental outages or flashovers caused by birds and animals coming in contact with the terminals.

KUHLMAN
Peerless
ELECTRIC
KUHLMAN ELECTRIC COMPANY
General Offices: Birmingham, Michigan
BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

No other locking adjustable like this new
CRESTOLOCK® WRENCH!



Engineered by the originators of the famous Crescent Wrench, here's a practical, dependable adjustable wrench *that can be locked at any infinite opening size within its capacity.* Basically, it's the time-proven Crestoloy Wrench PLUS a simple, positive locking device.

There is no working strain on the lock . . . no projections . . . it is operated by the thumb of the same hand that holds the wrench. If the lock should be damaged, the wrench is still operative as a standard Crestoloy. Available in 8, 10 and 12 inch sizes, chrome plated with stainless steel locking device.

GET YOUR COPY Forty pages, profusely illustrated. Tells how to do it easier and better with 30 different hand tools. Tips on care and maintenance. Send a dime or get a copy FREE with the purchase of any Crescent Tool.

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

If you need condenser and heat exchanger tubes for critical service...

Specify **Phelps Dodge**... a major supplier for nuclear projects!

Phelps Dodge condenser and heat exchanger tubes are currently in use in nuclear energy applications where highest quality and exacting specifications are essential.

Every Phelps Dodge tube intended for use in a nuclear project undergoes a series of severe tests to assure rigid conformance to the required specifications and ability to perform under the rigorous service conditions found in this highly specialized field. Testing facilities used by Phelps Dodge cover not only standard ASTM specifications but also include these special non-destructive tests:

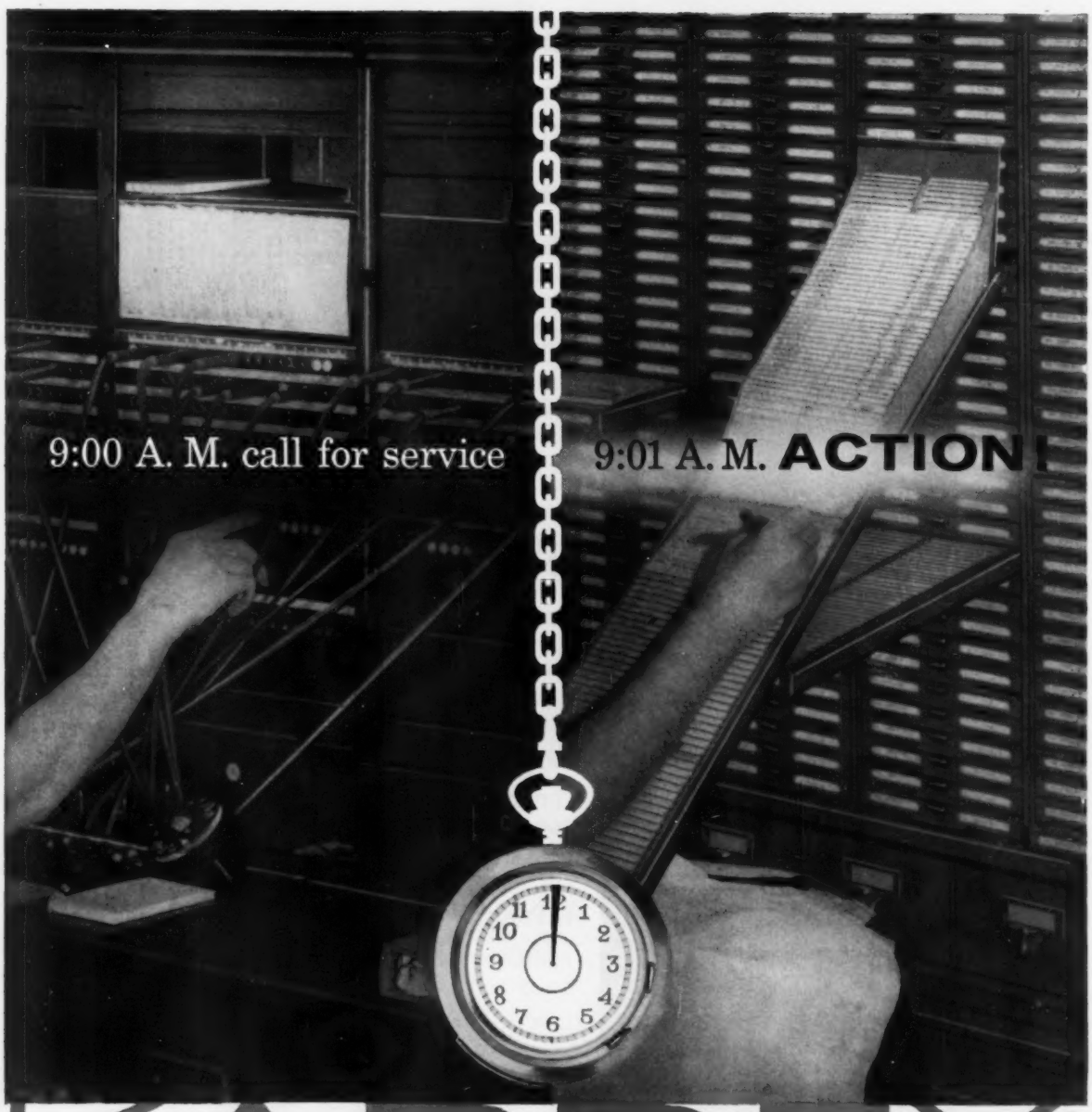
- Eddy-current inspection
- Dye penetrant test
- Ultrasonic inspection

To keep pace with the steadily growing importance of the nuclear power field, Phelps Dodge will soon open one of the largest tube mills in the world at South Brunswick, N. J. This mill will have the most modern automatic tube fabricating machinery, the finest research laboratories and the most advanced testing equipment.

Inquiries regarding your condenser and heat exchanger tube needs, particularly those requiring Electronic and Penetrant Tests, are invited.

PHELPS DODGE COPPER PRODUCTS
CORPORATION
300 PARK AVENUE, NEW YORK 22, N. Y.

PD



KARDEX®

VISIBLE RECORD SYSTEM

makes it possible—twenty-four hours a day

No matter what time of day or night a call for service comes in—KARDEX Customer Service Location Record enables you to serve customers *promptly and efficiently*. Result? Maximum customer good will at minimum operating cost.

When a call for service is relayed to the clerk at the KARDEX cabinet containing the records of the caller, the facts are noted on both a Master and Meter Order Card. Because the Meter Order Card "travels" as the order, *no further writing is necessary* —and within *60 seconds after the call* is completed the Meter Order Card is on its way to the dispatcher for action.

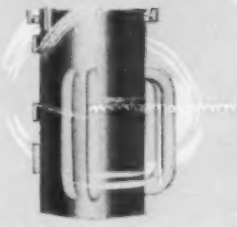
To learn of the many advantages of this system for serving and satisfying, write for FREE illustrated folder "New Horizons In Public Service" to Room 1943, 315 Fourth Avenue, New York 10, New York.

Remington Rand

DIVISION OF SPERRY RAND CORPORATION

FLOW COATING

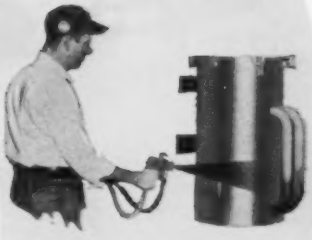
VAPORIZING



DE-GREASING

Protection

HOT SPRAYING

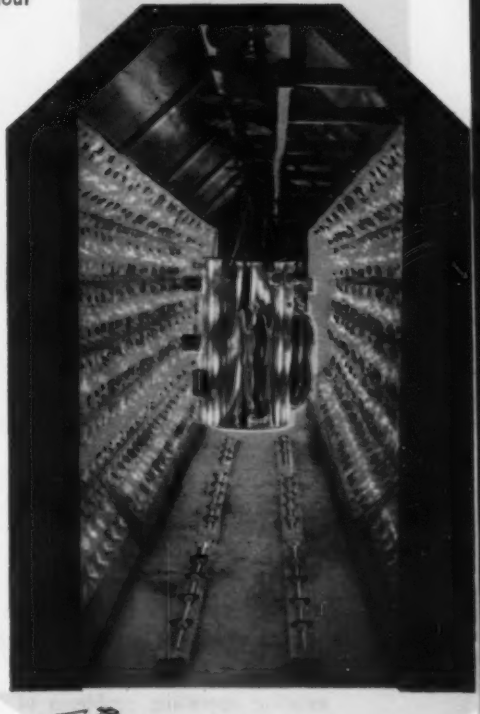


GRIT BLASTING

The tanks for CENTRAL pole type distribution transformers are processed through nine important steps to guarantee maximum protection against corrosion and other destructive agencies. Constant control of these nine steps, plus rigid inspection procedures is your assurance of a superior finish.

Here, in brief, are the steps—just nine more reasons why CENTRAL transformers are preferred throughout the nation:

BAKING



1. Grit Blasting—To remove scale and oxides.
2. De-Greasing—To insure maximum adhesion of paint to metal.
3. Flow Coat Primer—A baking Epoxy applied by generous flow. A base paint that is tough, chemically resistant and a barrier to rust creepage.
4. Vaporizing—Through a vapor chamber where paint volatiles are recirculated constantly to insure uniform coating of all surfaces, corners, crevices, etc.
5. First Baking—In an infra-red oven where time and temperature are precision controlled to insure proper curing.
6. Second Coat, Hot Spray—A thermo-setting acrylic resin coat that is chemical resistant, tough, yet flexible.
7. Second Baking—A repetition of the infra-red baking process.
8. Third Coat, Hot Spray—A baking alkyd-amine paint featuring flexible toughness and a high capacity for retaining gloss.
9. Third Baking—With the same careful attention to insure proper curing.

Throughout the entire painting and baking process, CENTRAL transformer tanks move by endless conveyor. After final baking and inspection, tanks are transferred to another conveyor for movement to assembly area. Controlled production technique as exemplified in this conveyor type painting process is the basis of our statement that—

We Design and Manufacture Quality Transformers, — Nothing Else!

"From Top to Bottom, Inside and Out, Every Step of the Way, CENTRAL Transformers Are Built for SERVICE."

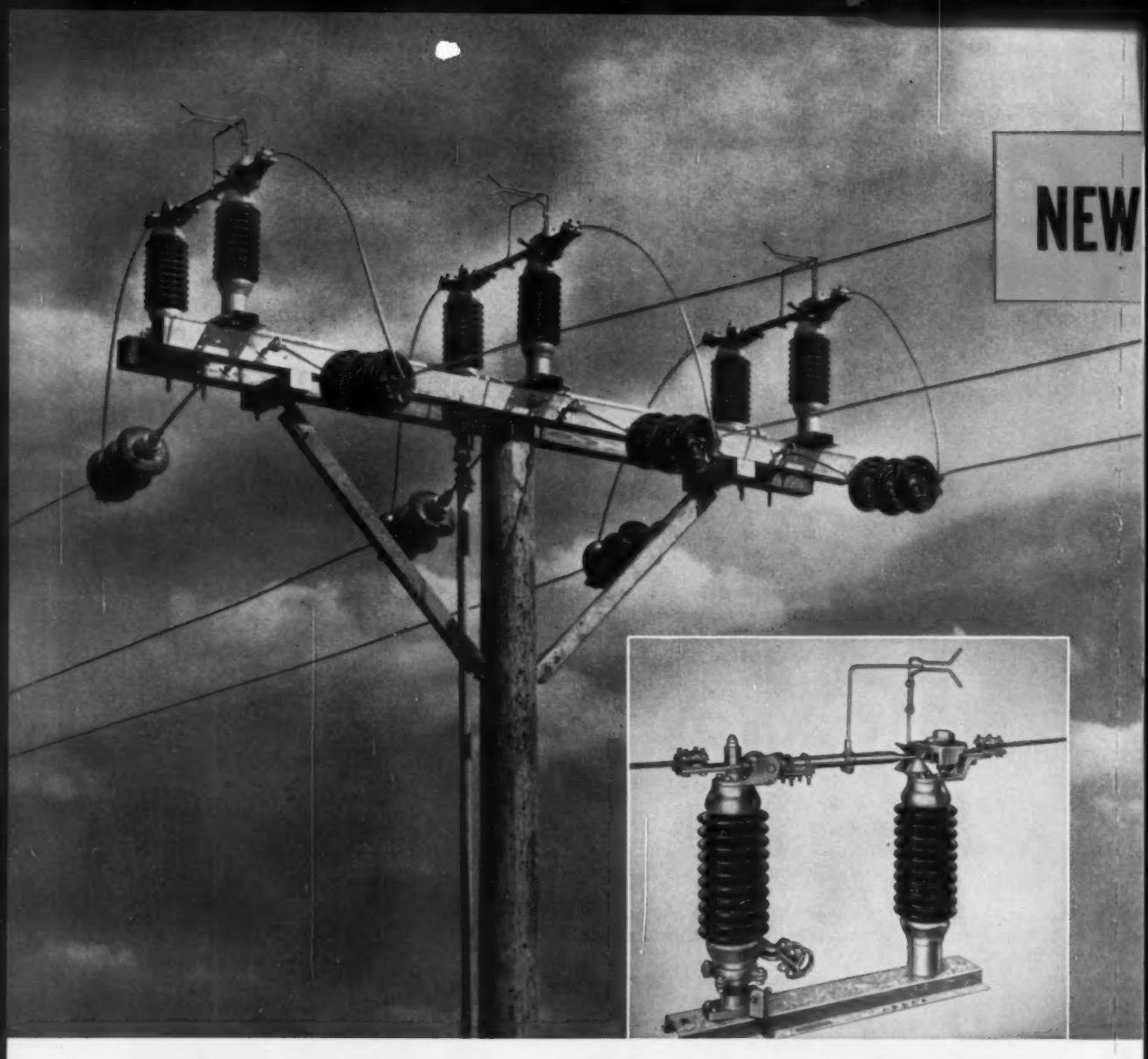
Central

TRANSFORMER CORPORATION

PINE BLUFF, ARKANSAS
Telephone JEfferson 4-5332

Sales Offices in Principal Cities

NEMA



NO OTHER SIDE-BREAK DISCONNECT GIVES YOU ALL OF THESE OPERATING ADVANTAGES

- **Correct contact always maintained at blade tip even if crossarm warpage distorts the switch base.**
- **All blades engage fully in the break-contact jaws without precise adjustment of the inter-phase rods.**
- **Less time and labor to install with Kearney original wide-tolerance mechanical design.**
- **Easiest, surest ice-breaking ability available on both opening and closing.**

This newest Kearney development solves long-existing operating problems of crossarm mounted group operated side-break disconnects. The best supporting structure or crossarm construction may . . . due to ice loads, age, wind or line strain . . . deflect enough to distort the switch bases, or alter the relative positions of the three phases. This often causes loss of contact or failure of all blades to close completely in conventional disconnects with both rigid blades and stationary break-contacts.

Kearney's advanced design features a self-aligning blade constructed to permit controlled vertical movement and axial rotation. This automatically compensates for base distortion . . . keeps the blade tip correctly aligned in the contacts. The break-contact swings 30-degrees with the blade as it is opened or closed, producing high leverage ice-breaking ability and full wiping of the silver current transfer surfaces. On closing, the blade tip fully engages the break-contact before the contact moves from its angular open position, compensating for any shift in position of the switch bases. This same feature also allows considerable freedom in interphase rod adjustment, enabling Kearney *Self-Aligning* side-break switches to be installed faster and more economically than other types.

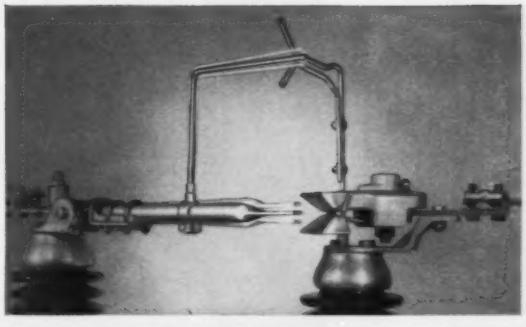
The details of these original features for maintenance-and-adjustment-free operation are shown on the facing page.

Kearney's

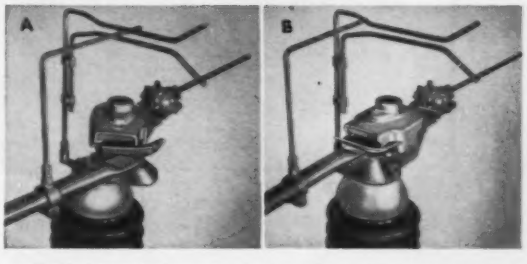
Self-Aligning SIDE-BREAK DISCONNECTS

...always make positive contact, even if the supporting structure warps, twists, bows or settles.

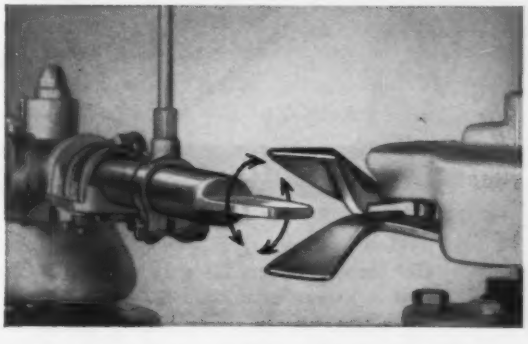
Self-aligning blade moves in a vertical plane to re-establish the original relationship between blade tip and contacts if supporting structure warpage distorts switch base. Wide mouth contact jaws assure blade entry into the contacts. Vertical 1¼" movement more than corrects for extreme cases of misalignment.



Break-contact swings 30° in the plane of blade travel as switch is opened or closed, providing highest leverage ice-breaking and full wiping of the current transfer surfaces. Note that the blade tip is fully engaged, and full contact is maintained (A) through the final 20° of blade travel to the fully closed position shown at (B). This feature allows more latitude in phase rod adjustment than other designs.



Blade rotates 12° on its longitudinal axis. If base distortion has affected blade-contact alignment, the blade tip will rotate as it enters the break-contact to keep all contact surfaces parallel, automatically restoring contact alignment. Friction reducing construction at all rotation points minimizes operating effort.



Switch carries full-rated load current well within NEMA temperature rise, from a fully closed position to 20° partially open position. Ratings available, 7.5 through 69 kv, 600 amperes. Equipped with conventional or whip-type arcing horns... torsional or spade-type operating mechanism. May be mounted horizontally, vertically, or underhung.

For full details talk to your Kearney representative, or write direct for Bulletin 8B.

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue, St. Louis 10, Missouri

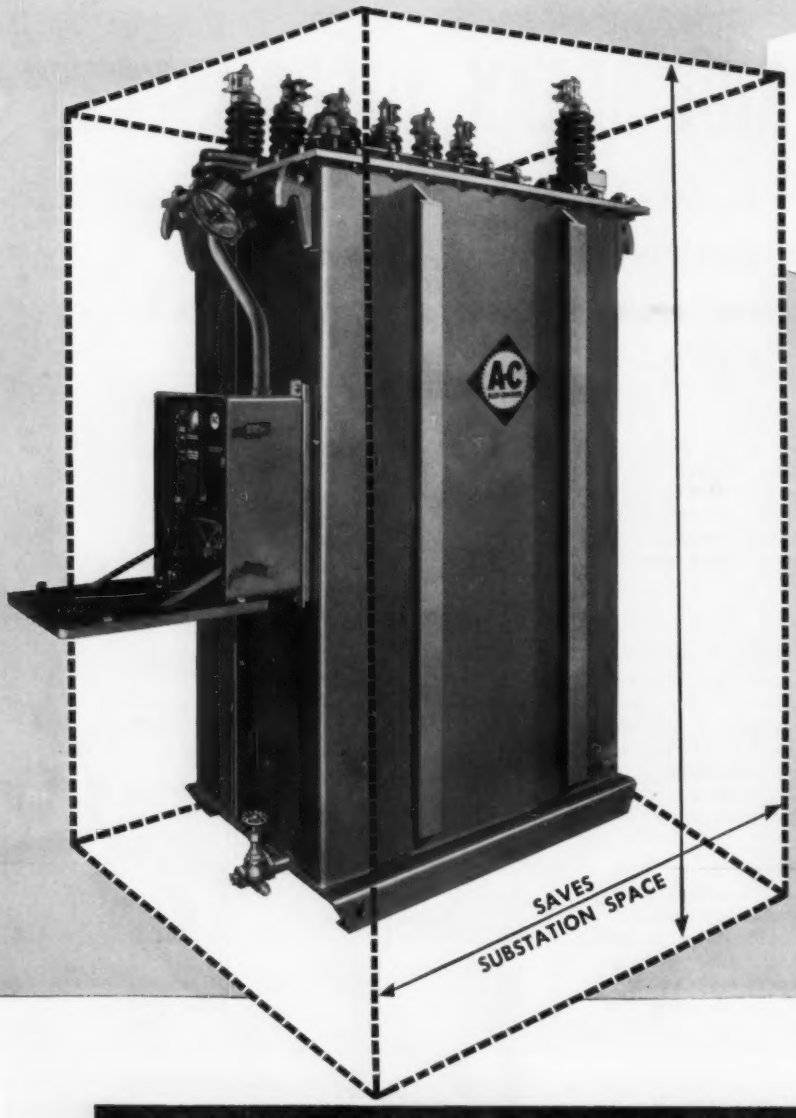
397

FOR BETTER CONSTRUCTION... SAFER MAINTENANCE

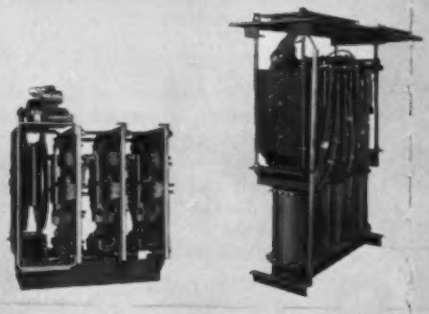
Specify Kearney Products

Plants at: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA

Allis-Chalmers—25 years of leadership in 5/8% regulators



NOW
save
33%
space...
30%
cost



Illustrations show heavy-duty tap-changing mechanism and unit construction combined with new space-saving arrangement of tap-changing mechanism.

NEW Allis-Chalmers 3-phase distribution regulators

Get these new benefits only with Allis-Chalmers new 3-phase distribution regulators:

- 33% less space required for distribution regulators in substation.
- 20% less weight for easier handling, lower installation costs than ever before.
- 30% less cost per kva of 3-phase regulation.
- 160% *Vari-Amp* rating is now provided to 600 ampere maximum.

Available in most popular ratings as follows: 500 and 750 kva, 8660 v; and 500, 750 and 1000 kva, 13,200 v.

The important savings offered by these new units warrant re-evaluation of your present substation planning.

Check with your nearby A-C office or contact Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Originators of 5/8% Step Regulators

ALLIS-CHALMERS

A-5768

SEPTEMBER 22, 1958

Why Not Be Optimistic?

Electric utilities weathered the 1958 recession in good fashion compared with most industries. But since results are far below the industry's historical growth pattern there may be a tendency to cut back long-range plans.

To be sure changes are called for and you will find a number in Electrical World's 9th Annual Electrical Industry Forecast beginning on page 101. But while there are changes, they do not reflect any loss of faith in growth prospects for the industry. In fact, you will find solid growth based on a recession period performance as illustrated by:

- A new record of residential energy sales, 9.6% higher than last year, despite poor appliance sales and a delayed spurt in housing construction.
- A drop of only 3.7% in industrial energy sales despite a severe 7% drop in industrial production.
- A 1.8% gain in total sales which is the envy of many recession-hit industries.
- The addition of a record amount (15.3 million kw) of new generating capacity.
- A new record for capital expenditures, maintained in face of cutbacks by other industries.

Certainly these results are impressive and, of course, they played a major part in revising the industry's long-term growth prospects. But let's put EW's new forecast into proper perspective by comparing it with what might now be considered the "optimistic" forecast of pre-recession 1957.

Last year we predicted that 1958 residential sales would hit 163.6 billion kwhr. Now we predict 161.2 billion kwhr just 1.5% under last year and well within the limits of forecasting accuracy. Changes in subsequent years such as cutbacks of 2.9% in 1959, 3.5% in 1960 and 4.8% in 1965 are more due to improvements in forecasting accuracy as the forecast period gets shorter and the post-war trend becomes clearer.

Industrial energy sales, of course, were hard hit by the 1958 recession. Our 1958 forecast for industrial sales is down 10.8% from last year's forecast of 305 billion kwhr. And 1959 and 1960 are down 7.8% and 6.9% respectively. but by 1965 our '58 forecast shows industrial sales catching up with our '57 forecast despite a new 1965 industrial production index 2.6% under last year's forecast.

Foolishly optimistic—not at all. The rate of growth of energy consumption per unit of production has been climbing even more rapidly than was previously indicated. And there's every reason to believe this trend will accelerate so that by 1965 a lower industrial production forecast will require as much energy as previously predicted.

Increased use of energy is a must as industries strive to lower break-even points under the stress of the cost-price squeeze. And as our economy grows, older facilities with low power consumption and high break-even points will be replaced.

The net effect of the '58 recession has been a short-range shift in our timing but not in our overall rate of growth. In terms of total sales, the new forecast for 1958 is now 6.4% under last year's forecast. And in 1959 and 1960 we are down 5.4% and 5.2% respectively. But in 1965 the cutback is only 1.5% and in 1970 only 1.9%.

Waterside continues coal burning in shadow of UN as . . .

FPC Defers Ruling on Con Ed Gas Case

Commission wants more time to study proposed contract between Con Ed and Transco for "X-20" pipeline service

The Federal Power Commission has indefinitely deferred its decision on a proposed contract, under which Transcontinental Gas Pipe Line Corp would transport up to 50 mcf of natural gas daily to Consolidated Edison Co of New York, Inc, for use as boiler fuel in Con Ed's Waterside No. 2 generating plant.

Under the proposal, Con Ed would buy the gas from Texas producers, and Transco would transport it to New York for an additional charge. This transportation service, termed "X-20", could be curtailed up to 60 days per year, during which time Transco would sell its own gas to Con Ed.

Con Ed would use the gas as boiler fuel to replace coal burners in its mid-Manhattan generating station. New York public health officials had testified that the conversion would help reduce air pollution created by Waterside.

The FPC said it needs more time to study the examiner's July decision in the case. Although Examiner William J. Costello approved the proposed transportation service, he did not comment on the merits of Con Ed's proposed use of the gas for boiler fuel. He pointed out that "the commission has no legal basis for questioning the merits of the proposed industrial use of natural gas deliveries, as long as such use has no effect on residential consumer service." However, if industrial use were a factor in the Con Ed application, he added, then "the facts do not justify the authorization."

In addition, the FPC also wants to study the examiner's ruling that Transco should use a "cost-of-service" method to determine the rates for any of its gas sold to Con Ed.

The FPC stated that "no compelling urgency exists" for immediate consideration of the Con Ed application, and FPC sources said there is no way of knowing when the commission will rule.

The Con Ed proposal is part of a larger application, which the FPC approved, allowing Transco to increase its gas deliveries to other customers by more than 173 mcf of gas daily. In approving the bulk of Transco's application, the FPC did not limit the initial price of new gas to be sold to Transco by new producers.

In earlier testimony, Con Ed officials had pointed out that in 1950, Trygve Lie, United Nations Secretary-General, asked New York Mayor William O'Dwyer to help to provide natural gas to Con Ed for its Waterside Station, but apparently the request was referred to President Truman, who in turn referred it to the FPC. The FPC evidently replied to Truman that transmission lines at that time could not handle enough additional gas to replace coal at the plant, and the matter was dropped.

Dr Greenburg, New York's air pollution director, had testified that, in his opinion as a doctor, Waterside's flyash and sulfur dioxide are harmful to humans, although there has been no test on the matter prepared by his department.

A test run from August, 1955, to March, 1956, near the Waterside Plant, showed that "sootfall" jars collected enough deposits of stack exhaust to average 180 tons per sq mi vs a city-wide average of 70-75 tons per sq mi.

Ellis Urges Sweeping Law Changes

Co-op group's leader calls for carte blanch on setting up public power districts, federated G&T units, federal transmission grids, service areas and loads. REA Administrator Hamil favors private financing for co-ops

Bristling like a porcupine, the National Rural Electic Cooperative Association has outlined a long list of legislative demands it will make on Congress and the state legislatures in 1959. NRECA General Manager Clyde Ellis is stumping for support of the proposals at the annual fall meetings in the ten NRECA regions.

The meetings are being held between Sept. 4 and Nov. 18 in French Lick, Ind., Galinburg, Tenn., Burlington, Vt., Madison, Wis., Bismarck, N. D., Oklahoma City, St. Petersburg, Fla., Denver, Missoula, Mont., and Brownsville, Tex.

REA Administrator David Hamil also is speaking at the regional meetings in favor of private financing for co-op construction needs.

Ellis Levels Charges

Charging that "the power companies of the United States are not a part of our free enterprise system," Ellis has come up with a broad public power program, apparently aimed at placing both public and private electric companies in power districts. Listed below are some of the demands which Ellis will push:

- Authorize and permit the establishment of public power districts, setting forth a procedure for placing co-ops and all other non-federal power facilities within these power districts.
- Permit co-ops, municipals and power districts to federate more easily to build and operate their own G&T systems—REA loans to be available for whatever percentage of capital is needed.
- Enact federal laws establishing federal transmission grids, or to require others to build them, throughout the country, to be available to all who desire to sell or purchase power over them at a fixed cost.
- Make utility, municipal, state and federal transmission lines common carriers for federal regulation.

ELLIS: 'Our free enterprise'

- Eliminate the 1,500-population maximum in the REA Act on the size of communities for which loans may be made.
- Enable co-ops to collect treble damages plus all legal costs in cases where private utilities "delay" the co-ops' proposed expansion of G&T or distribution facilities.
- Prohibit state regulatory commissions from imposing, or allowing others to impose, any restrictions or penalties on the size or type of load, which co-ops or power districts may serve.
- Prohibit any electrical supplier from taking away a consumer of another electrical supplier.
- Prohibit any franchised or certificated utility from "promoting, propagandizing, or otherwise encouraging" a co-op to sell out.
- Enact both state and federal legislation to require all private utilities to file annually with the commissions in states where they operate a list of owners of their voting stock.
- Establish enough federal atomic energy plants to prove which are the best types, and establish costs.
- Enact state and federal laws to prohibit lobbying and propaganda activities by private companies, which are "in effect public service agencies of the state."
- Remove from the state regulatory commissions any power to deny cooperatives' right to build G&T facilities.
- Require state regulatory bodies —whether co-ops are under their jurisdiction or not—to recognize co-ops as "citizens" entitled to wholesale power suppliers in their area.

Ellis is also pointing to the success of NRECA's recently-created "Minuteman" program, whereby "rural leaders" are enlisted to promote rural electrification. He said that the first membership goal —10,000—has been reached, and the association is trying for 20,000. Ellis's goal is 100,000 "Minutemen."

Hamil is urging co-ops to accept private financing as the best means of refuting criticism that they are getting "special favors" from the use of federal loans at a below-cost (2%) interest rate. Public relations, said Hamil, is one way of answering the criticism, but "it's not much good unless you have the facts on your side."

He emphasized that, although co-op borrowers have paid back to REA $48-million more than REA's cost to obtain the funds from the U. S. Treasury, this was not a profit to the federal government. Actually, it is a $32-million loss, Hamil said, because the interest payments to REA do not cover the higher costs which the Treasury had to pay to obtain the loan funds.

"Farmers don't expect their purchases of (other) commodities to be below cost; they are willing to pay the going rate. Why shouldn't this be true of the electricity the farmer buys?" Hamil asked.

He added, "In addition, the expected size of the loan funds required in the future suggests that we search for an additional source of capital. There are few businesses today that . . . rely wholly on a single source of financing."

Boom's a Boon Up to 13.5 Kv

That's Arthur Thomas, in shirt sleeves, who's holding the dragline in the photo. Above him the end of the crane's boom has run into a 14.4-kv line. He's smiling about it because his invention, the Saf-T-Boom, can prevent most of the deaths caused by contact of a crane with lines carrying 13.5 kv or less, he claims.

Thomas' invention will be effective except in the few instances when the underside of the boom contacts conductors: protection of the underside would get in the way of the dragline. The demonstation was co-sponsored by Houston Lighting & Power Co.

In tests at Arkansas Power & Light Co, the device withstood 36 kv for 5 min without leakage. It can withstand 50 kv for 1 min in good weather; 40 kv for 15 sec on wet days. The Saf-T-Boom is made of weatherproofed ¾ and 1 in. steel tubing and has four General Electric Co 15-kv insulators. Produced at 422 Pyramid Bldg, Little Rock, Ark., the device sells for $625 for cranes 20 tons and over; $575 for under 20 tons.

U.S. Power Picture

- **Electric Living Program set for February debut**
- **Defense Dept sidesteps foreign equipment issue**

National Electric Week will find many of the members of Edison Electric Institute backing a nationwide promotion to persuade homeowners to the all-electric way of life. The EEI board of directors approved the formal plan for an Electric Living Program at a recent meeting.

The $2.8-million promotion will be financed by voluntary contributions from member companies, said J. E. Corette, president of EEI and Montana Power Co. The effort, which includes emphasis on Medallion Homes, "is designed to represent a rallying point for manufacturers and other trade allies in the electrical field to concentrate and coordinate their selling efforts in the residential market," Corette said.

Beginning in February, the EEI program will be carried on national TV networks, and in magazines, newspapers and other media. "With this basic activity," plus tie-ins by manufacturers and allies, "we expect to achieve a new effectiveness in selling electrical living at both the local and national levels," Corette said.

From another promotion front came encouragement for those who have actively backed Live Better Electrically. Based on a Gallup Organization, Inc, survey in 300 cities, 53% of a cross-section of adult Americans recognized a purposely obscured symbol as that of Live Better Electrically, and 82% of those polled were familiar with the Live Better Electrically slogan.

On symbol identification, the Live Better Electrically motif and the gas industry's "blue flame" were recognized by 53% of those interviewed, while Reddy Kilowatt was familiar to 60%. But 82% had seen or heard "Live Better Electrically" vs 69% for "Only gas does so much more—for so much less" and 42% for "Full Housepower."

When asked what the slogan meant personally, 48% said Live Better Electrically meant that electricity makes life or housework easier. An additional 48% said it implied "there should be more appliances in the home."

• The Defense Department has issued its ruling on a complaint by General Electric Co that an Italian electrical equipment firm—apparent low-bidder on the Fort Peck Dam—could not legally be awarded the bid because it has no repair and testing facilities in the U. S. or Canada.

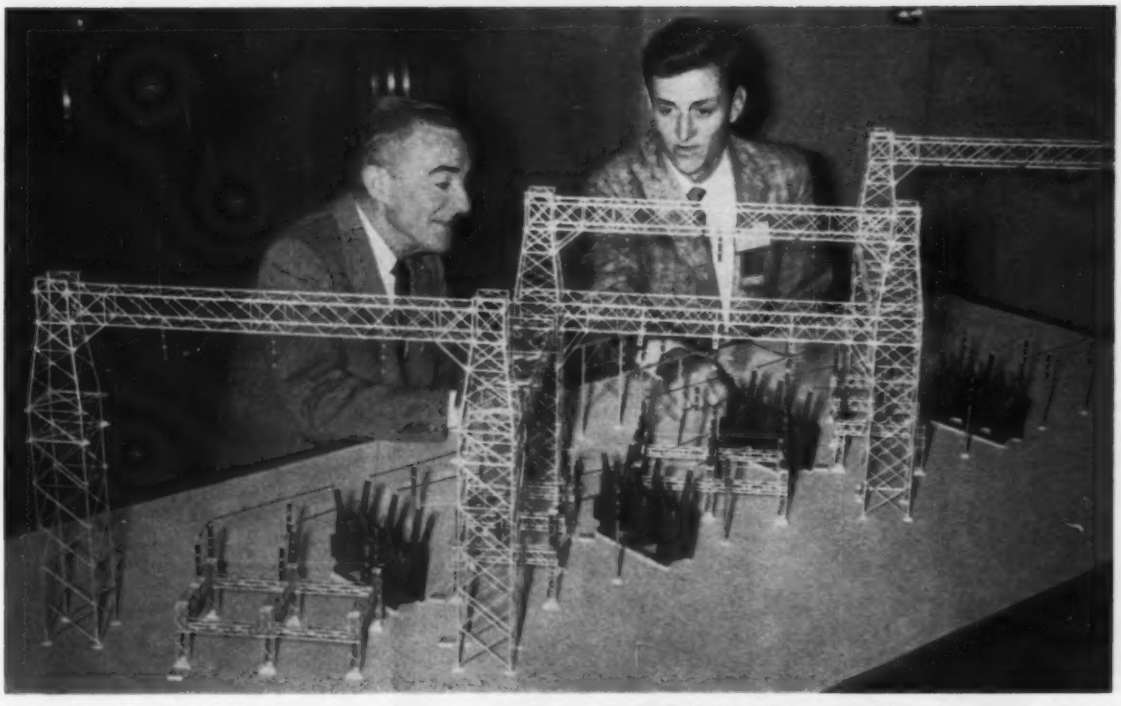
A Defense spokesman said that his department had clearly sidestepped the issue, but it's not clear yet whether domestic or foreign firms will claim the victory.

The Defense Department clause involved requires that any "bidder shall have available or under construction within the U. S. or Canada at the time of the bid opening complete repair and testing facilities of adequate size to service the equipment being proposed; and shall state the location and ownership of these services."

The Defense Department said that the intent of the clause was "not to require ownership by any firm" of R&T facilities, but that the clause would be satisfactorily fulfilled "if any firm has available such facilities through contractual agreement with firms, organizations or institutions in the U. S. or Canada." The Pentagon also said it would "assist, if possible, any firm, which may experience difficulty in getting facilities."

• Although Richard Searles, unsuccessful candidate for the Arizona Democratic nomination for governor, was overwhelmed by Attorney General Robert Morrison in the primaries, he has stirred up interest

(*Continued on page* 100)



MODEL of zig-zag 230-kv ring-bus for four-circuit, four-breaker layout is discussed by R. F. Gibbons, Federal Pacific Electric Co (left) and R. N. Connelly, Sacramento Municipal Utility District of AIEE Sacramento meeting, season's first

AIEE Told Zig-Zag Ring-Bus Saves

Pacific Coast kick-off meeting gets design details and hears Hickernell on 75th anniversary 'modest celebration' plans

A new approach to high-voltage ring-bus design, imparting a distinct zig-zag configuration to the steel structure, was introduced to the industry at the August 19-22 Pacific General Meeting of the American Institute of Electrical Engineers at Sacramento.

The zig-zag arrangement is a basic and generally more economical modification of the vertical-plane type of ring bus, according to R. N. Connelly, Sacramento Municipal Utility District, and R. F. Gibbons, Federal Pacific Electric Co. SMUD will use the zig-zag for the 230 and 115-kv rings at its new Hedge Substation.

Comparing with a conventional vertical-plane bus configuration for a six-breaker, six-circuit, 230-kv, 900-kv (BIL) ring, Connelly reported the zig-zag arrangement:

- Uses 11% less steel,
- Reduces footing costs 40%,
- Reduces insulation points materially,
- Provides more latitude for line takeoff direction, and
- Allows clear side access to each breaker bay for maintenance.

The zig-zag requires about the same area as the conventional vertical-plane ring, Connelly added.

Saves on Steel

The 230-kv zig-zag ring uses 56.5% of the steel and half the area needed by Pacific Gas & Electric Co's standard double bus with separate OCB/air switch structure, J. L. Buckley said. The PG&E scheme uses one OCB per circuit with air-switch bus selection, plus tie and parallel OCBs. Steel needed by a new design considered for this double scheme is about equal to that for the zig-zag ring, but the land required is twice as much, he said.

This meeting kicked off the AIEE's celebration of its 75th Anniversary, Pres L. F. Hickernell told the delegates. A general plan for a year-long "modest celebration" has been formulated.

The institute now has machinery and flexibility to keep pace with the growth era the electrical industry has entered, Hickernell stated. But whether it will do so depends on its ability to attract those dedicated to industry and professional welfare, he continued.

Pacific G&E's expansion program, aimed at pacing a projected long term 7% system growth, includes immediate and definite plans for conventional high-efficiency steam, hydro, nuclear and geothermal stations, according to C. C. Whelchel.

"We expect that by 1965, one or possibly two large nuclear electric

(*Continued on page* 175)

Shop Conveyor System Speeds Meter

M. E. HOLLEY, Meter Shop Superintendent, Philadelphia Electric Co, Philadelphia, Pa.

A conveyor system utilizing gravity rollers, skate wheels, and motor driven belts simplifies a meter handling problem for Philadelphia Electric Co. Designed to handle 600 meters per day, the system could be modified to take up to 1,000. Meter testing cost has been reduced about 30% over past methods.

The meter handling system consists of a gravity roller conveyor for moving meters packed in cartons, gravity skate wheels for moving empty cartons, and motor driven belts on three levels to transport the individual meters. The installation cost $12,500, substantially below an original $20,000 estimate.

METER SEALS ARE REMOVED at the second station. Empty cartons are diverted by the conveyor to another station to receive tested meters

A pallet load of meters packed in cartons is transported by hydraulic hand truck to the first station at the head of a roller conveyor. Cartons are placed on the initial rollers for movement to the second station. At the second station the cartons are opened, meter seals removed, and meters placed on the upper level belt for movement to the third station where a high potential test and preliminary inspections are made. Empty meter cartons remaining at station two are raised to the head of the skate wheel conveyor which moves them to the final inspection station where tested meters are repacked.

At the preliminary inspection location, or third station, meters are removed from the upper belt and placed on a metal shelf, which extends on either side of and parallel with the middle level belt for the entire length of the station. Meter covers are removed here and meters are given an insulation test. Each meter then is checked for the correct register ratio marking; a 10% sample of all meters have their registers checked for accuracy

Old Poles Cut Building Cost

Consumers Power Co has utilized poles from its own stock pile to build an inexpensive garage for three trucks. Corrugated galvanized sheet metal was installed as roofing and siding.

Built for about 50% less than more conventional buildings, the garage was completed in five days. Properly treated poles insure long life and structural rigidity.

Handling

on a register checking device.

The jewel and top bearing are checked for tightness, the watt-second constant is rubber stamped on the meter grid and the potential latch is opened. Covers then are replaced and meters are slid on to the intermediate level belt for movement to the test stations.

At the test stations, or fourth positions, meters are assigned a company serial number and calibrated. Having completed his operations, the tester places the meter on the lower level conveyor belt for movement to the next station.

At the final inspection, or fifth station, the meter, with its accompanying test card and set tag, is removed from the belt and placed on an inspection shelf. Here the meter, test card and set tag are compared to ascertain that they have the same company number and are dated. Final tests are made and the cover is properly tightened and sealed.

The meter with the set tag attached is placed in an empty carton which has been awaiting it on the skate wheel conveyor. The inspector retains the test card and at the end of the day forwards all cards to the meter shop office for filing. When the meter carton is full the inspector depresses a stop which releases the carton, allowing it to move to a roller conveyor which terminates at a station adjacent to the starting station.

The motor driven belts are not in continuous motion but are controlled from various positions along the line of operation. The carton opening and final inspection stations have foot operated switches for control; other positions are controlled by a cable running the full length of each belt. Belt speed is about 16 fpm.

The motored belt system is so designed that should a "change out" program be inaugurated, the present belt line can be lengthened. An additional belt system can be installed for carrying the meters from the test positions to the repair section for rehabilitation.

CALIBRATION AND TAGGING of meters is performed at the fourth inspection station. Meters are then sent to the final station and packed in cartons

Bushing Removes Broken Studs Safely

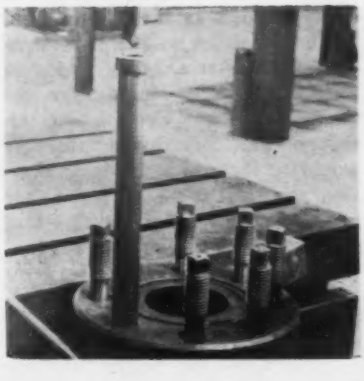
OSCAR WINTLE, Maintenance Foreman, Indiana-Kentucky Electric Co, Madison, Ind.

Broken turbine valve studs may be removed safely by using a guide bushing and a $\frac{3}{4}$ x 16-in. long drill. The stud is removed without damage to the $1,600 valve pressure seal head.

The 8-in. guide bushing that supports and centers the drill is machined from $\frac{5}{8}$-in. I.D. steel tubing to an outside diameter of 0.813 in. Because the root diameter of $\frac{3}{4}$-in. thread is 0.620 in., a drill with a 0.625-in. diameter will sever old threads and permits their removal without destroying internal threads in the head.

Removing broken studs at the plant avoids sending the heavy pressure heads back to the factory. Spare pressure heads can be kept in stock instead of in transit between the plant and factory.

Doing the job at the plant saves $100 in shipping costs.



(*Continued from page* 96)

with one platform proposal. Searles, former Undersecretary of Interior and former president of the Salt River Water Users & Power District, recommended that the Water Users make a payment in lieu of taxes.

In the near future the project under its present set-up would be able to make a net profit of $10 million annually, Searles claimed in a public letter to Lee Rice, a project director. Rice and the project used TV, radio and newspaper ads to answer the recommendation, claiming increased electric revenues have allowed reductions in water charges and that the "surplus" is not "cash in the bank" but funds reinvested in plant.

Nonetheless resentment exists in Phoenix against the project. The big reason is because all land in the Salt River Valley is assessed for water—whether land owners get it or not. It comes in the form of a first lien and if unpaid pyramids against any future sale of the property.

Atomic Progress

- Shadow falls on Piqua

In an opinion that is specifically tentative and one which it may reverse, the Committee on Reactor Safeguards has cast a shadow over the future of a municipal atomic power plant at Piqua, Ohio. The committee objects to the site proposed for the project as unsuitable. It does not question design or safety features of the reactor unit.

The objection to the site—even if it stands after a formal review in October—is not binding on the Atomic Energy Commission although the commission probably would be loath to override its decision again. It did that in the case of the Power Reactor Development Corp's fast breeder project at Monroe, Mich., and touched off a two-year legal wrangle that still is unresolved.

The Piqua reactor would be organic-moderated, a relatively new and advanced design. Atomic International, a division of North American Aviation would be the contractor.

BRIEFS: Excessive stress resulting from a notch in a blade root caused the failure of the turbine generator of the Experimental Boiling Water Reactor at AEC's Argonne National Laboratory. The manufacturer, Allis-Chalmers Mfg Co, found one of the turbine blades and its shroud became detached from the rotor. A-C attributed cause of the notch to an incorrectly adjusted clamp that held the blade during machining. Blades were not affected by steam from the reactor.

Rates and Regulation

- Area concept agreement reached in Mississippi dispute
- Utah P&L abandons use of residential demand meters

A major utility dispute between an electric co-op and a private utility company has been amicably settled, Mississippi Public Service Commission Chairman Norman A. Johnson, Jr, has announced.

The Capital Electric Power Association of Jackson and the Mississippi Power & Light Co have reached agreement on area concepts, he reported. Johnson said that this will apparently forestall extensive hearings before the commission and possible unlimited litigation.

The PSC has been engaged in hearings over a period of several months on similar disputes between the Mississippi Power Co, serving the southern and eastern parts of the state, and area co-ops.

Pending now is a decision on an argument between Mississippi Power Co and the Singing River Electric Power Association, a cooperative at Lucedale.

Still in progress of hearings and slated for renewed testimony and arguments is the case of a petition by the East Mississippi Electric Power Association of Meridian and the Mississippi Power over franchise rights in two counties.

● Utah Power & Light Co has abandoned residential demand meters as unneeded and annoying to high-usage customers.

The utility's residential rate schedule previously called for installation of a demand meter when monthly usage exceeded 1,000 kwhr twice successively. Some 3,200 customers were affected.

The demand clause in the residential rate originally was designed to protect against system high demand patterns which high-usage customers were expected to create.

UP&L's studies showed that appliance diversities, higher than anticipated, had prevented the system high demands from evolving.

Despite the fact that the demand meter permitted an actually fairer overall charge, UP&L found it was impossible to convince the "demand customers" of this. Says a public relations analyst:

"How can you promote the use of electricity and then put on a special meter charge when a customer's use is going up? At the same time, it may be possible to prove to a customer the special meter actually gives him a better shake. But you can't convince him because he feels innately that if he is, in fact, paying more under regular metering, why would a company be crazy enough to help him pay less?"

The Utah Public Service Commission will hold hearings on the change only if any objection is raised. None is expected.

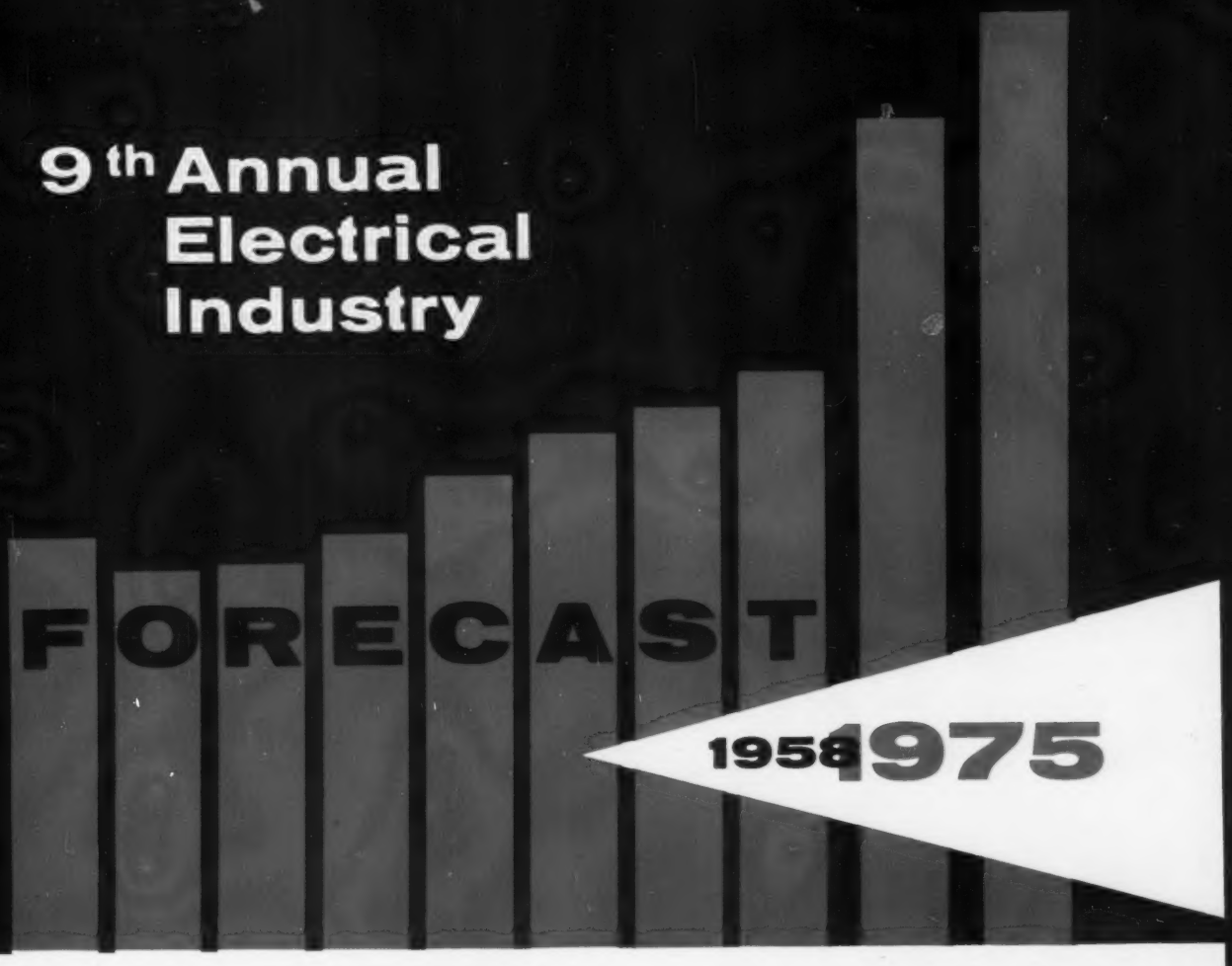
'59 PLAN

HOW MANY . . .

. . . turbine generator units have been retired in the past 5 years? What was their average size and age at retirement?

See the October 6 issue of Electrical World

9th Annual Electrical Industry



Contents

Peak Loads and Capability . 102
Construction Budgets 104
Economic Outlook 106
Residential kwhr Sales 108
Industrial kwhr Sales 111
Commercial kwhr Sales 115

ARTHUR J. STEGEMAN,
Manager, Market Research

There's no better time to be realistic than during a business downturn when the rosy outlook of boom times is dimmed and we are forcibly brought back to the grim realities of business life.

This new Electrical World forecast has been hammered out of an "agonizing reappraisal" of our national economy. It's a hard-boiled forecast based on our economists' analysis of the forces that contributed to the sharp business decline earlier this year. And it's a better forecast because our economists had the advantage of witnessing, firsthand, the effectiveness of countermeasures employed by government and business to combat the possible spiraling effect of a business downturn.

But despite this vigorous, critical analysis you will find on the following pages that the net result is a strengthening of our faith in growth prospects for the electric utility industry and, of course, for the American economy in general.

The changes to be found in this year's forecast will play an important part in your own short and long-term planning. For instance, you will find:

- Energy sales inching up 1.8% in 1958
- Sales jumping 9.5% next year.
- Capital expenditures down 8.6% in 1959 reflecting less spending for generation and transmission.
- Distribution expenditures moving up 6.8% next year.
- Transmission plant expenditures firming up with a 2.3% gain in 1960 and a 7.1% gain in 1961.
- Capacity additions bouncing back up to 13.2 million kw in 1962 after dipping to 9.6 million kw in 1961.
- Total expenditures hitting a new peak of $5.7 billion in 1962.

Total Energy Sales to Jump 9.5% in 1959

Total sales of electric energy will jump 9.5% next year to 622 billion kwhr after racking up a relatively slight 1.8% gain this year. But as small as the 1958 increase will be it will set a new industry record of 568 billion kwhr which is remarkable considering the sharp downturn in sales experienced by most industries during the 1958 recession.

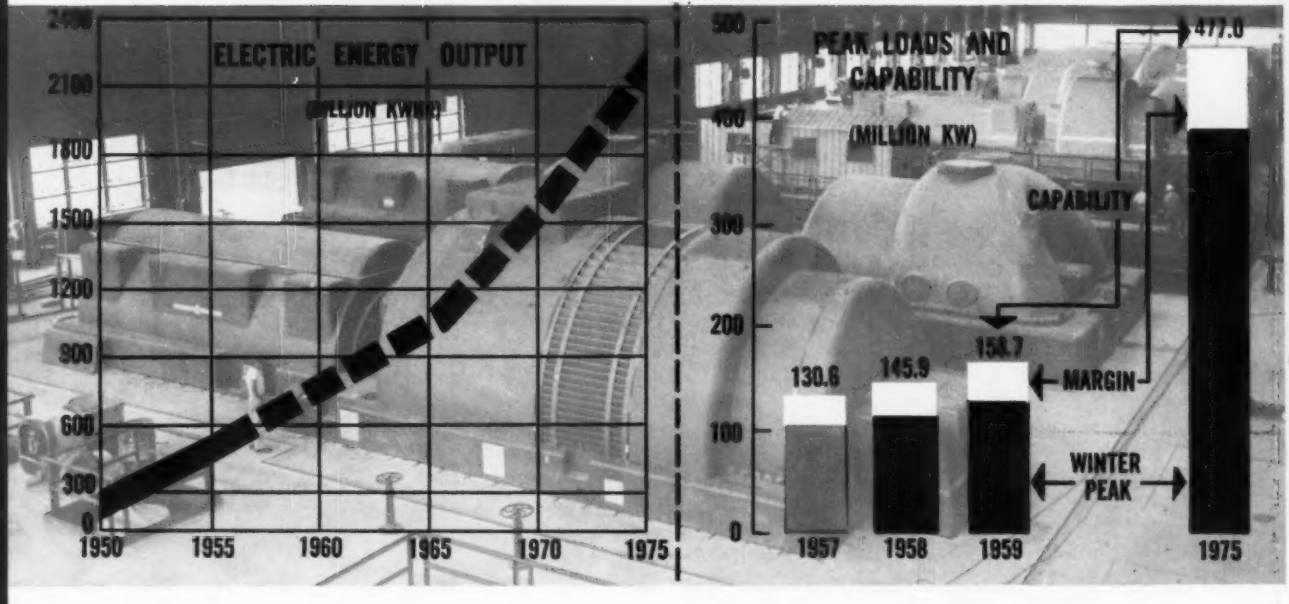
Residential Sales Up 9.6% in '58

Sales to residential customers are mainly responsible for keeping industry sales on a rising curve. For despite cutbacks in consumer disposable income, appliance purchases, and listless new home construction in the first half of the year, residential customers will boost their 1958 electric energy consumption by 9.6% to 161 billion kwhr.

Rate Will Continue in '59

And there is every indication this rate of growth will continue into 1959. Consumer disposable income will be up, homebuilding will be at a faster pace, and even long-suffering appliance sales should show signs of renewed strength. With these forces at work residential sales should jump 9.4% to 176 billion kwhr.

Commercial sales of electricity will also contribute to the industry's encouraging 1958 performance by hitting 100.9 billion kwhr



Winter Peaks to Climb 7.1 Million Kw This Year;

Peak loads on class I systems will increase to 114 million kw in 1958—an increase of 6.6% over last year.

Based on forecasts for a rising economy in the latter part of 1959 that year's peak should hit 126.1 million kw—12.1 million kw or 10.6% more than 1958.

Additions Hit 15.3 Million Kw in 1958

More than 15.2 million kw of new capacity going into commercial operation in 1958 will boost the industry's generating capability 11.7% to 145.9 million kw—almost double the year-end figure of 76.2 million kw in 1951. Another 12.8 million kw next year will increase capability to 158.7 million kw.

As a result, the 1958 winter margin will zoom to about 28% from 22.2% last year. But by 1959 it will drop back to 25.9%.

However, both figures are misleading as an absolute measure of reserve generating capacity. This fact becomes even more apparent as the nation's utilities swing over to a summer rather than a winter peak. A truer margin would best be calculated by measuring each utility's reserve capacity at the time the annual system peak occurs.

Applying this approach to Edison Elec-

After Inching Up 1.8% in 1958

for the year—6.1% more than 1957.

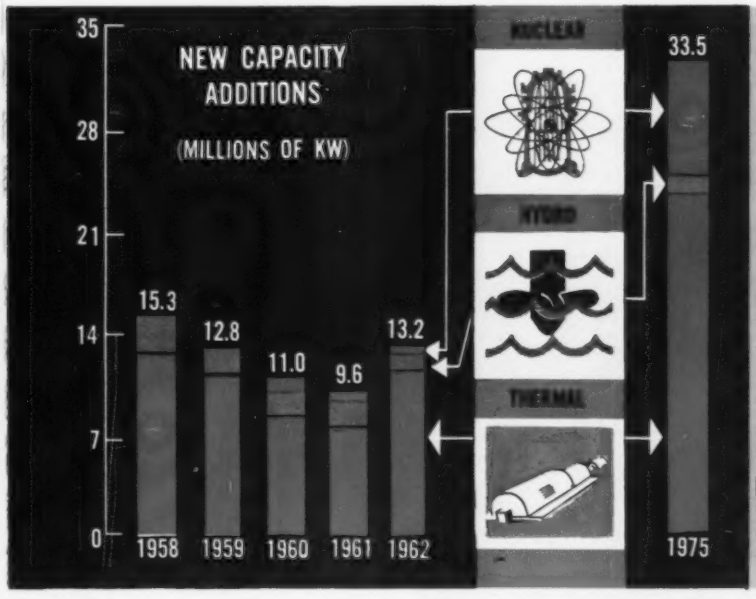
Next year's gain should be even better. Forecasts indicate 1959 commercial building construction will jump 8% following a 1958 gain of 1%. Thus new construction and an expected rebirth of deferred modernization plans should boost 1959 commercial sales 8.5% to 109.5 billion kwhr.

Industrial Sales Are Big Drag

Industrial energy sales will be the big drag on the industry's growth rate in 1958. For the year, industrial purchases of electricity will be down 3.7% under last year's total of 283 billion kwhr. But even in this area there is reason for optimism since the downturn does not nearly reflect the 7.0% dip in industrial production anticipated for the year.

And with our national economy already showing signs of a pickup, industrial sales in 1959 will more than regain this year's losses by spurting 10.4% to almost 301 billion kwhr—nearly double the 1951 rate of 158 billion kwhr.

By 1975 total electric energy sales will jump 275% over 1957 to 2.1 trillion kwhr. Residential sales will skyrocket to 708 billion kwhr per year by 1975—more than total industry sales by 1960. Industrial sales will likewise contribute to this growth by increasing to 863 billion kwhr—205% over last year.



NEW CAPACITY ADDITIONS
(THOUSANDS OF KW)

	NUCLEAR	HYDRO	THERMAL	TOTAL
1956	0	1,008	5,499	6,507
1957	100	1,204	6,288	7,592
1958	0	2,528	12,758	15,286
1959	0	1,470	11,295	12,765
1960	725	1,560	8,747	11,032
1961	35	2,200	7,365	9,600
1962	245	1,100	11,855	13,200
1963	200	1,100	13,884	15,184
1964	300	1,100	14,143	15,543
1965	500	1,100	14,679	16,279
1970	2,500	1,100	20,032	23,632
1975	8,500	1,100	23,947	33,547

12.1 Million Kw in 1959

tric Institute's data for 1957 on a regional basis revealed an actual yearly margin closer to 18% rather than 22.2% as indicated at the time of the December peak.

Margin Will Dip to 21.5% by '61

However, a certain amount of excess capacity will exist for the next few years. It will take until 1961 to get winter margins down to about 21.5%—just slightly under the 22% which must be considered ideal in the light of growing summer peak loads.

As a result, additions to generating capacity will decline from this year's high of 15.3 million kw to a low of 9.6 million kw in 1961 before bouncing back up to around 13 million kw in 1962.

By 1975 an expanded economy will push our December peak loads to 391 million kw —284 million kw or 265% more than 1957.

To maintain our "ideal" winter margin of 22% will require a generating capability of 477 million kw—almost 4 times as much as last year. Our population growth and the rate at which it will expand our national economy will require the addition of more than 33 million kw of new generating capacity in that year alone.

G&T Spending To Trim '59 Budgets 8.6%

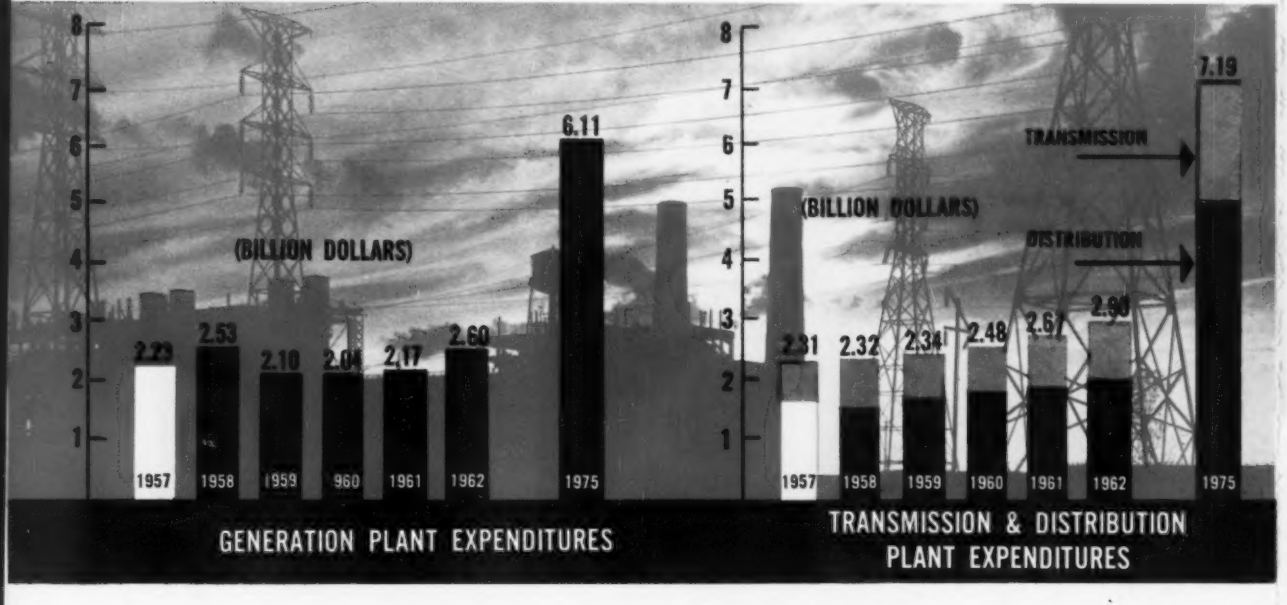
Electric utility construction expenditures in 1959 will be reduced 8.6% from this year's record high of $5.1 billion. This year's final figure, incidentally, will be roughly $200 million short of the total indicated in Electrical World's last annual survey of utility construction and expenditures made in December 1957 before the economy felt the full effects of the 1958 recession.

Generation Spending to Drop 17%

Capital spending on new generating plants will account for most of the downturn in 1959 budgets. This cutback, which will amount to 17% or $431 million, was to be expected since these budgets had risen from $1.5 billion in 1956 to a high of $2.5 billion this year.

As capacity additions will be on the decline between now and 1962, generation expenditures will fall to $2.1 billion next year and $2.0 billion in 1960. Generation spending will begin a new upward cycle in 1961 by rising to $2.2 billion to provide for an upsurge in capacity additions in the early 1960's.

Transmission plant expenditures will be chopped 9.6% in 1959 to $728 billion reflecting to some extent the fall off in generating capacity additions. However, by 1960 with industrial energy sales back on a healthy growth curve along with residential sales, new transmission line requirements and heavying up of older facilities will require the expenditure of $745 million—2.3% more than in '59.



Distribution Spending Up 6.8% In '59

Spending for new distribution facilities will increase 6.8% next year to $1.6 billion. This will be the first substantial gain registered in this area since 1956 when distribution expenditures hit $1.5 million.

However, the stage has been set for a gradual increase in spending for distribution. Residential and commercial use of electricity, which determines modernization and expansion requirements of distribution facilities, has been growing at a fairly substantial rate over the last few years. This, in addition to a pickup in new home construction, will boost spending 7.4% in 1960 and another 8.0% to $1.9 billion in 1961.

By 1975 the electric utility industry will be spending almost $14 billion annually for new plant and equipment in terms of today's prices—nearly three times the $5.1 billion record set this year.

Output, Peak Loads, Capability

	Output billion kwhr	Winter Non-Coincident Peak Load million kw	Load Factor %	Capability million kw	Gross Margin % Peak
1948	277.0	51.1	61.9	54.4	6.6
1949	287.7	54.0	60.8	61.7	14.2
1950	328.6	62.0	60.9	68.4	10.3
1951	370.8	68.1	62.1	76.2	11.8
1952	398.3	72.8	62.2	81.5	11.9
1953	441.2	78.4	64.2	92.4	17.8
1954	471.9	85.7	62.8	103.7	21.0
1955	542.6	97.9	62.1	116.1	18.6
1956	597.2	102.4	65.1	122.6	19.7
1957	626.7	106.9	66.9	130.6	22.2
FORECAST					
1958	**639.8**	**114.0**	**64.1**	**145.9**	**28.0**
1959	**701.1**	**126.1**	**63.5**	**158.7**	**25.9**
1960	**763.9**	**137.3**	**63.5**	**169.7**	**23.6**
1961	**828.1**	**147.6**	**64.0**	**179.2**	**21.5**
1962	**896.9**	**157.6**	**65.0**	**192.2**	**22.0**
1963	**975.2**	**169.8**	**65.6**	**207.1**	**22.0**
1964	**1,059.1**	**182.2**	**66.4**	**222.2**	**22.0**
1965	**1,148.8**	**195.1**	**67.2**	**238.0**	**22.0**
1970	**1,654.7**	**276.2**	**68.4**	**337.0**	**22.0**
1975	**2,379.9**	**391.0**	**69.5**	**477.0**	**22.0**

Data in this table is for Class 1 Systems. These operate about 97% of the nation's generating capacity. All other data (kwhr sales, capital spending, etc.) is industry-wide.

Construction Expenditures

	Generation	Transmission	Distribution	Miscellaneous	Total
	million dollars				
1948	$1,103	$400	$1,075	$84	$2,662
1949	$1,410	$400	$1,190	$93	$3,093
1950	$1,275	$425	$1,127	$109	$2,936
1951	$1,344	$504	$1,089	$131	$3,068
1952	$1,925	$577	$1,118	$118	$3,738
1953	$2,088	$647	$1,200	$127	$4,062
1954	$1,939	$666	$1,288	$122	$4,015
1955	$1,547	$571	$1,343	$161	$3,622
1956	$1,479	$598	$1,518	$186	$3,781
1957	$2,234	$747	$1,566	$199	$4,746
FORECAST					
1958	**$2,531**	**$805**	**$1,510**	**$205**	**$5,051**
1959	**$2,100**	**$728**	**$1,613**	**$178**	**$4,619**
1960	**$2,041**	**$745**	**$1,732**	**$181**	**$4,699**
1961	**$2,165**	**$798**	**$1,870**	**$193**	**$5,026**
1962	**$2,599**	**$902**	**$1,999**	**$220**	**$5,720**
1963	**$2,830**	**$974**	**$2,142**	**$238**	**$6,184**
1964	**$2,962**	**$1,031**	**$2,292**	**$251**	**$6,536**
1965	**$3,156**	**$1,102**	**$2,456**	**$269**	**$6,983**
1970	**$4,543**	**$1,577**	**$3,498**	**$385**	**$10,003**
1975	**$6,106**	**$2,189**	**$5,003**	**$532**	**$13,830**

Population Gains of 4 Million a Year Will

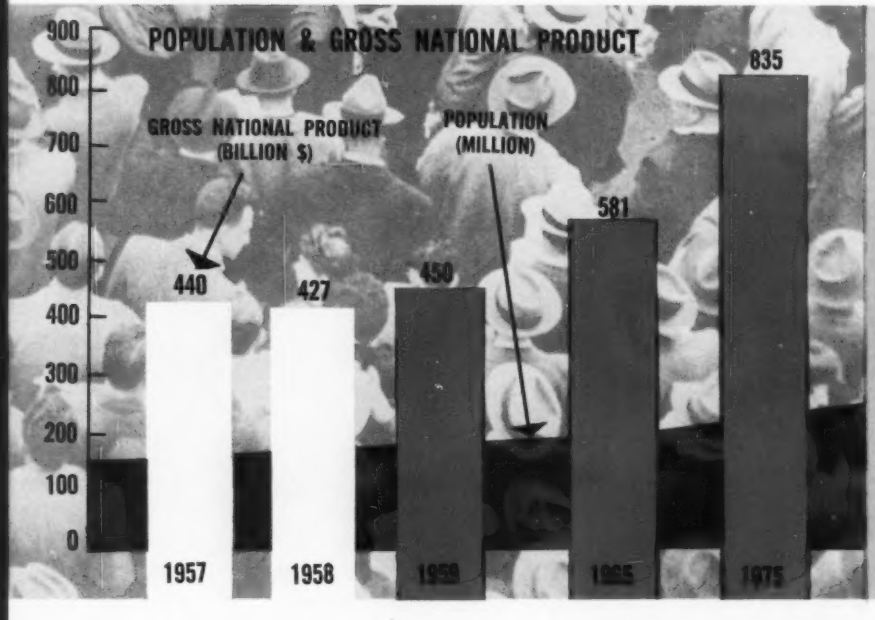
One ingredient necessary for long-term growth hasn't changed during the 1958 recession. This is our estimate of population growth.

That's because the children we count on to boost population to new highs have already been born and are well on their way to becoming members of the labor force and consumers of goods and services. This new wave of consumers is a product of the post World War II baby boom.

Current Population Growth

Because population growth plays such an important part in economic growth we have every reason to be optimistic about the near future. Despite family formations of only 700,000 per year compared with 1.4 million in 1949 our annual birth rate is 4.3 million compared with about 3.6 million in 1949. The net effect after adjustment for deaths and immigration changes is a current population increase of about three million people per year. In other words by July of next year we shall have created a completely new market for goods and services that is three-fourths the size of New York City and in only two short years since the pre-recession month of July 1957.

By 1975 the forces outlined above will



Population Will Jump 35% By 1975

New births and lengthening life span will boost population by more than 61 million between now and 1975. This is the equivalent of seven consumer marketing areas the size of New York City.

New Home Construction Will Hit 1.6 Million,

New home construction will more than keep pace with population and household growth. By 1975 housing starts will be a whopping 1.6 million a year or better. That will be the minimum required to shelter our rapidly rising population.

At this moment new home construction has apparently checked its decline since 1955 when 1.3 million new homes were constructed. An easing of the mortgage money market in combination with some government encouragement and a slight buildup in consumer demand boosted housing starts in the first half of 1958 over the same period last year. At this point it appears 1958 starts will climb to 1.1 million from last year's 1,042 million.

While this is still considerably above our current rate of family formations it is expected that the housing market will continue to improve in the near future with annual starts reaching 1.2 by 1960 and almost 1.4 million by 1965.

There are two reasons for this optimistic outlook. The first is that our national highway program and our urban renewal pro-

Push Total to 235 Million in '75

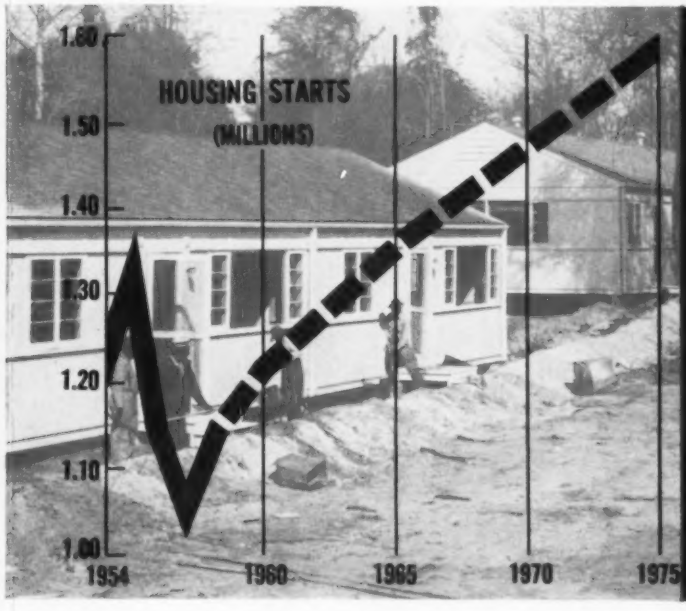
boost our population to 235 million an increase of 64 million people over last year. And of equal significance is the growth rate of around 4 million a year.

Households Will Keep Up

New family formations will reflect past and current population increases. From where we now stand it appears household additions will bounce back up to about 900 thousand per year by 1963 and then gradually increase each year to a rate of about 1.4 million by 1975.

Actually households will climb slightly faster in relation to population than they have in the past. This is being brought about by more leisurely living and added emphasis on medical research which will lengthen our life span considerably.

This fact itself will also help to expand our economy. The growing population of old folks will be better off financially than most grandparents are today. Expansion of pension plans by corporations and an improved government social security program will enable our retired citizens to indulge themselves with conveniences and luxuries designed particularly for their needs. Thus a whole new market for goods and services will be growing by 1975.



GNP $835 Billion in 1975

grams are depleting our total housing inventory at a constantly increasing rate.

The second reason is that our population growth is considerably higher than household growth meaning that families themselves are getting bigger thus creating a need for new and larger quarters.

Gross National Product

One measure of our national health closely akin to the family budget is Gross National Product—the measure of the overall output of goods and services. Since it measures the amount of disposable income consumers have, it is not surprising that this year GNP will tumble 3.0% to $427 billion from $440.4 billion last year.

But economists tell us this is only a temporary setback that will merely shift rather than handicap our long-term growth. And there's every reason to be confident of this diagnosis because our GNP in terms of constant dollars has been growing at an average rate of 3.5% per year since 1930 despite depressions, recessions and major wars.

Gains in Disposable Income Will Boost Average

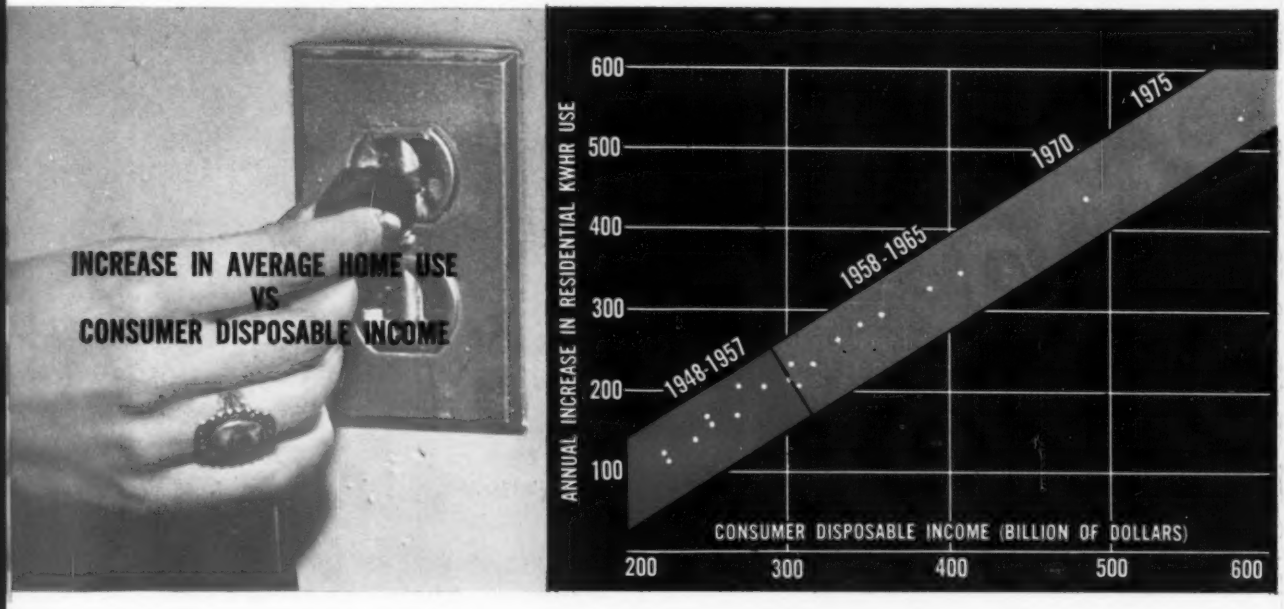
In the long run, consumer disposable income will determine how much consumers will spend for the comforts of electric living, and, in turn, how many kwhrs per year each customer will use on the average.

As GNP will decline this year, it follows that consumer disposable income will drop 1.3% from last year's high of $305 billion. But next year consumers will have more to spend—$12 billion more, in fact, for a total of $313 billion. And in 1960 they will have another $15 billion added to their spending money.

While this will undoubtedly help the long-depressed appliance market, it isn't probable that there will be any tremendous surge in new appliance purchases such as we experienced in 1955. For one thing, most people are pretty well stocked with most basic appliances, thus permitting them considerable leeway in deciding what they will buy and when. Another thing is demands of newborn and teenage children are at an all time high thus dictating that a certain amount of consumer disposable income go for such basic necessities as food, clothing and education.

Research Pays Off

What we can count on is that research will devise new electric conveniences that in combination with improved older appliances will



1958 Residential Sales Will Top '57 by 9.6%;

Residential kwhr sales will naturally reflect the increases in customers and their average annual use. This year both will combine to boost 1958 residential sales 9.6% to 161.2 billion kwhr—nearly double the 87 billion kwhr sold only six short years ago in 1952.

In 1959 total sales will jump another 15.1 billion kwhr or 9.4% to 176.3 billion kwhr.

By 1975 residential sales of electricity will add up to 708 billion kwhr—27% more than the 558 billion kwhr sold by the industry to all classes of customers last year.

As optimistic as this target seems it is not unrealistic. There are already many areas of the country where average annual use is in the neighborhood of 12,000 to 16,000 kwhr per year with some all electric homes approaching an average use of 30,000 kwhr per year.

Average Cost Will Decline

The average cost of electricity to residential customers will continue to decline although probably not as fast as it has in the past. Consumers themselves will be mainly

Use to 10,000 Kwhr by 1975

continue to claim a fairly steady percentage of growing consumer disposable income.

1958 Average Use Up 7.4%

Despite the downturn in appliance purchases since 1955, residential customers have continued to increase their use of electricity mainly because they are making more use of appliances already installed, particularly electric heating units and air conditioners.

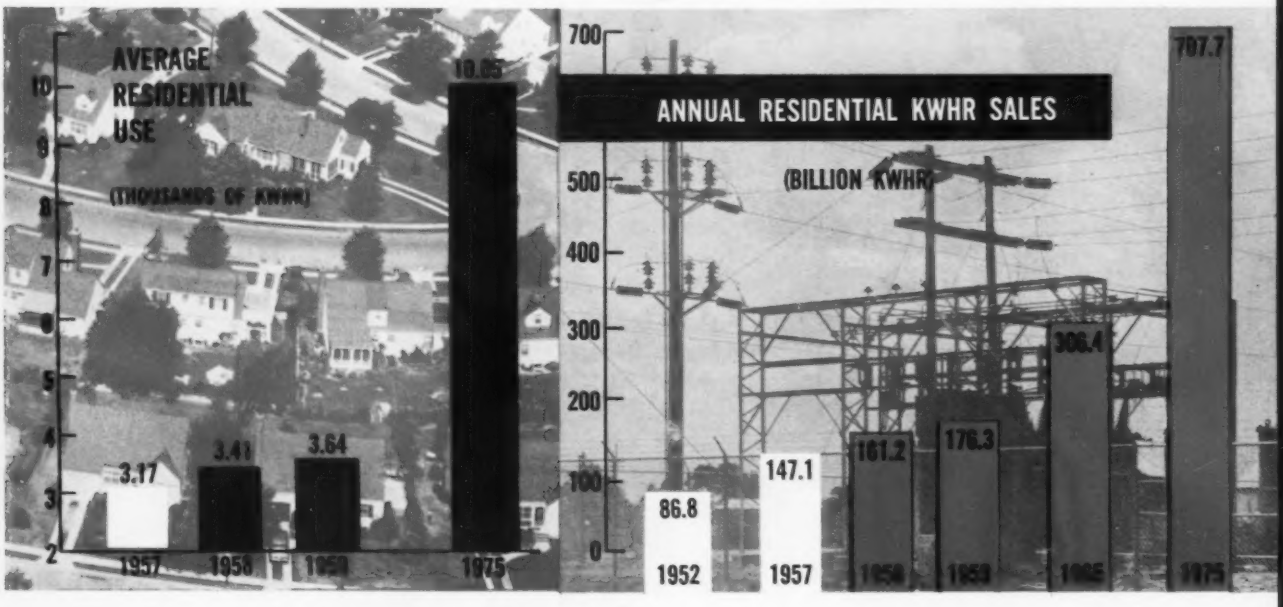
This year average residential use of electricity will increase 7.4% or 234 kwhr to 3,408 kwhr per year.

Over the long term increased consumer acceptance and recognition of the comforts of year-round electric heating and cooling will steadily boost average annual use to at least a minimum of 10,000 kwhr per year by 1975—over 6,800 kwhr more than 1957.

Customer additions this year will sink to a post war low of somewhere between 950 thousand and one million, compared with 1.3 million in 1956 and 1.2 million in 1957.

A resurgence of the economy accompanied by a pickup in employment along with gains in home building will boost new customer additions to 1.1 million in 1959.

By 1975 there will be 71 million residential customers on the industry's distribution lines with more than 1.5 million more coming on the line each year.



Kwhr Cost Down 2.3%

responsible for further declines because of increased use, but further efficiencies in generation will probably continue to help some.

This year, residential customers will pay an average of 2.50¢ per kwhr for electricity —2.3% less than last year and less than half the cost of an average kwhr in 1948.

By 1975 the cost will drop still another 7.6% to 2.31¢ per kwhr.

Average annual residential electric bills will keep climbing right through 1975. This, of course, will be due to consistent increases in average annual use. This year the average bill will be up $3.95 to $85.20—still less than the amount spent by the average smoker in one year.

In 1975 residential customers will pay an average of $232.20 per year for their electric service.

Revenue Up 7.2% Over Last Year

Revenues from residential electric service will total $4 billion this year—up 7.2% over 1957's $3.8 billion. Next year revenues will register a 7.6% gain topping $4.7 billion.

Population, Households, GNP

	Population million	New Nonfarm Dwelling Units thousand	Households million	Gross National Product billion 1957 dollars	Consumer Disposable Income billion 1957 dollars
1948	146.6	932	40.8	317.1	222.4
1949	149.2	1,025	42.5	316.7	225.0
1950	151.7	1,396	43.7	344.1	242.9
1951	154.4	1,091	44.8	370.1	249.2
1952	157.0	1,127	45.6	382.6	256.1
1953	159.6	1,104	46.4	399.3	268.3
1954	162.4	1,220	47.1	393.0	270.1
1955	165.3	1,329	48.0	425.1	287.6
1956	168.2	1,118	49.0	435.3	299.2
1957	171.2	1,042	49.7	440.4	305.1
FORECAST					
1958	**174.2**	**1,100**	**50.4**	**427**	**301**
1959	**177.2**	**1,150**	**51.1**	**450**	**313**
1960	**180.3**	**1,200**	**51.8**	**475**	**328**
1961	**183.4**	**1,225**	**52.6**	**495**	**343**
1962	**186.5**	**1,250**	**53.4**	**515**	**358**
1963	**189.6**	**1,275**	**54.3**	**536**	**373**
1964	**192.8**	**1,300**	**55.2**	**558**	**388**
1965	**196.0**	**1,350**	**56.1**	**581**	**404**
1970	**214.0**	**1,500**	**61.4**	**700**	**486**
1975	**235.0**	**1,600**	**67.4**	**835**	**580**

Average Residential Use and Residential Sales

	Customers millions	Use per Customer kwhr	Revenue per kwhr cents	Average Annual Bill	Sales billion kwhr	Revenue million dollars
1948	33.5	1,563	3.01	$47.05	51.0	$1,533
1949	35.4	1,684	2.95	$49.68	58.1	$1,717
1950	37.5	1,830	2.88	$52.70	67.0	$1,932
1951	39.2	2,004	2.81	$56.31	77.0	$2,165
1952	40.7	2,169	2.77	$60.08	86.8	$2,401
1953	42.0	2,346	2.74	$64.28	97.1	$2,659
1954	43.1	2,549	2.69	$68.57	108.5	$2,920
1955	44.4	2,751	2.64	$72.63	120.5	$3,187
1956	45.7	2,969	2.60	$77.19	133.9	$3,477
1957	46.9	3,174	2.56	$81.25	147.1	$3,759
FORECAST						
1958	**47.9**	**3,408**	**2.50**	**$85.20**	**161.2**	**$4,030**
1959	**49.0**	**3,643**	**2.46**	**$89.62**	**176.3**	**$4,337**
1960	**50.2**	**3,908**	**2.43**	**$94.96**	**193.8**	**$4,709**
1961	**51.4**	**4,190**	**2.42**	**$101.40**	**212.9**	**$5,152**
1962	**52.6**	**4,488**	**2.41**	**$108.16**	**233.4**	**$5,625**
1963	**53.9**	**4,803**	**2.40**	**$115.27**	**256.0**	**$6,144**
1964	**55.2**	**5,133**	**2.39**	**$122.68**	**280.3**	**$6,699**
1965	**56.5**	**5,481**	**2.38**	**$130.45**	**306.4**	**$7,292**
1970	**63.5**	**7,482**	**2.33**	**$174.33**	**470.6**	**$10,965**
1975	**71.0**	**10,052**	**2.31**	**$232.20**	**707.7**	**$16,348**

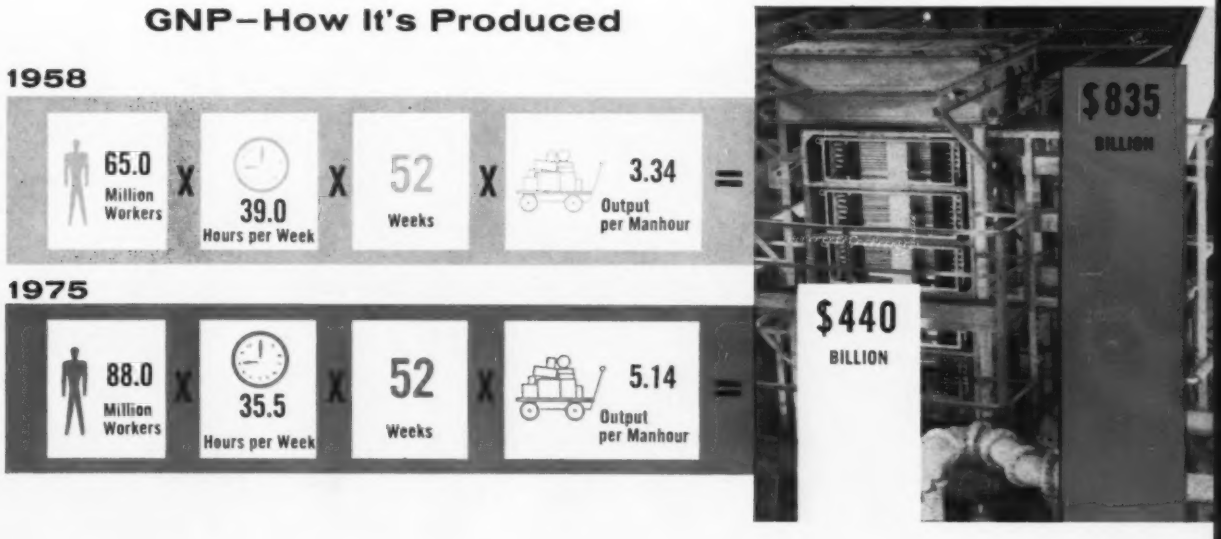
Industrial Output Will Increase 88% by '75

While industrial production trails 1957 and unemployment lingers at its post-war high, it may seem incredulous to think about manpower shortages in the 1970's. But providing the goods and services demanded by a larger population with a higher standard of living will require a solution to just this problem.

It is estimated that our higher standard of living in 1975 will require an 88% increase in industrial production.

But the labor pool in 1975 won't be large enough to meet this challenge at today's level of productivity, for even though our population will be growing at a good clip, the labor force will be rising at a much slower rate. That's because our population will be growing with the new children and older retired people.

In addition we will be working fewer hours per week. The average work week will probably drop from today's level of 39 hours to 35.5 hours per week by 1975. The net effect will be a pinch in manhours. While employment will climb 35% by 1975 manhours will increase only 23%.



By 1975 Productivity Must Increase 54%

Here's what this means in terms of production. In 1957, 65 million workers on the job 39 hours a week, 52 weeks a year, produced a Gross National Product of $440.4 billion. Meaning that each manhour worked contributed $3.34 to our national product. But in 1975, 88 million workers will have to produce $835 of GNP at 1957 prices. To do this in a 35.5 hour week they will have to produce $5.14 of goods, and services each and every manhour. That means that output per manhour has to increase 54%.

This goal is not as difficult as it may seem. From 1930 to 1950, hours of work declined about three hours per decade. During the period 1930 to 1957 productivity (output per manhour) increased an average 2.5% per year. Actually we did better than this average in the ten years immediately following World War II.

However, it appears that continued improvements in technology during the 1960's and 1970's will continue to boost output per man-hour at least an average of 2.5% per year.

But even this rate of growth may not be enough to boost industrial production 88% to 264 on the Federal Reserve Board's index (1947-49 average = 100). That's because by 1975 the pinch on manufacturing production workers will be even greater than for the total labor force.

Boosting Productivity to '75 Demands Will

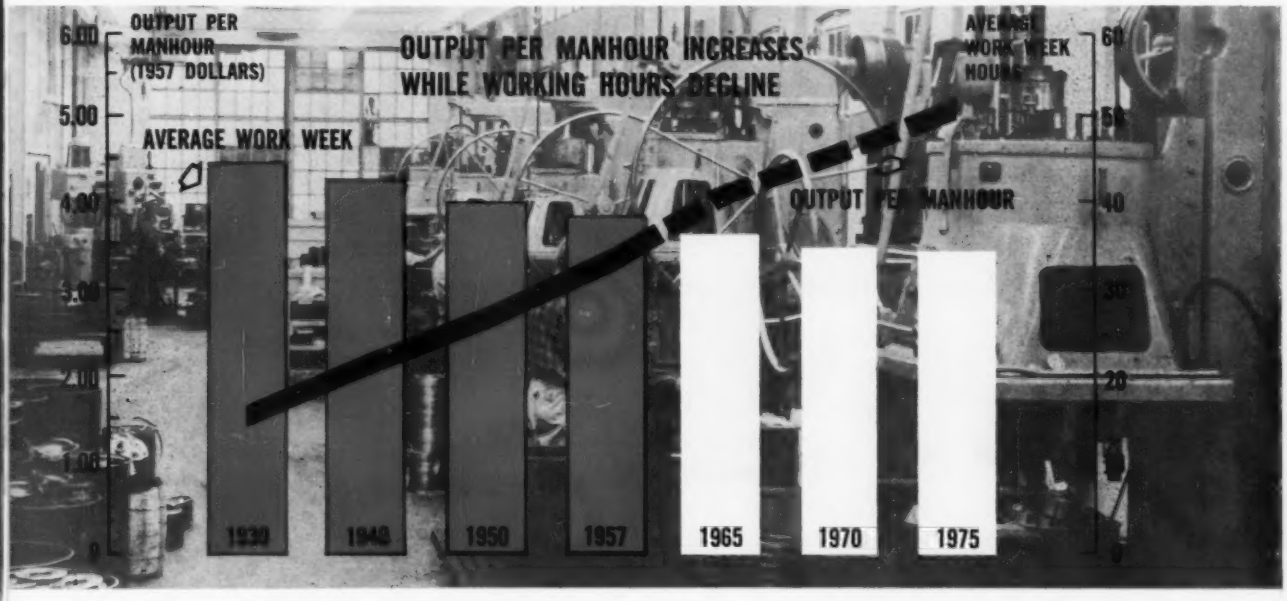
Available manhours can only be equated to 1975 production requirements through the use of more electric energy. It won't be anything revolutionary because the trend to increased use of electricity in production has been going on since the time the very first industrial kwhr was sold. But the trend has accelerated to such an extent in recent years that it has been given the popular title of "automation."

Here's what this means in terms of the FRB's manufacturing production index.

Back in 1950 it took a billion manhours to provide 4.4 points of the manufacturing production index. Last year the same amount of labor provided 5.4 points meaning that labor productivity in manufacturing registered an average gain of 3.2% per year over this period.

By 1975 the same amount of labor will have to provide 9.3 points of the index meaning that productivity gains will have to average 4% per year.

In terms of electric energy, manufacturers used 1,397 million kwhr per point of the production index in 1950 and 1,670 million kwhr per point in 1957 for a gain of 19.5%. By 1975 use per point of the FRB manufacturing index will hit 2,839 million kwhr—up 70% over last year.



Industrial Sales Spurt of 10.4% in 1959 Will

While manufacturing use of electric energy per unit of production continues to increase, the gains will not overcome the dip in 1958 business activity.

With economists predicting a decline of 6.9% in the 1958 manufacturing production index from last year's high of 145, total manufacturing use of electric energy will decline 3.5% to 234 billion kwhr.

Atomic Energy Commission use of electricity is a negative factor for the second year in a row. According to AEC officials, an ample stockpile of atomic raw materials permitted a cutback in energy requirements beginning July 1 of last year. Thus AEC purchases of energy fell 2.1% in 1957 from the '56 high of 57.8 billion kwhr. With this same cutback still taking effect, 1958 purchases will drop another 3.5% to 54.6 billion kwhr where it is expected they will remain into the forseeable future.

The aluminum and magnesium producers, suddenly hit by a slowdown in orders and large inventories, have sharply curtailed production this year.

In 1958 combined primary production of

Take 70% More Electricty

In terms of use per manhour these figures indicate that in 1950 the average production worker used 6.1 kwhr each hour on the job. In 1957 he used 9.1 kwhr per manhour or 49% more.

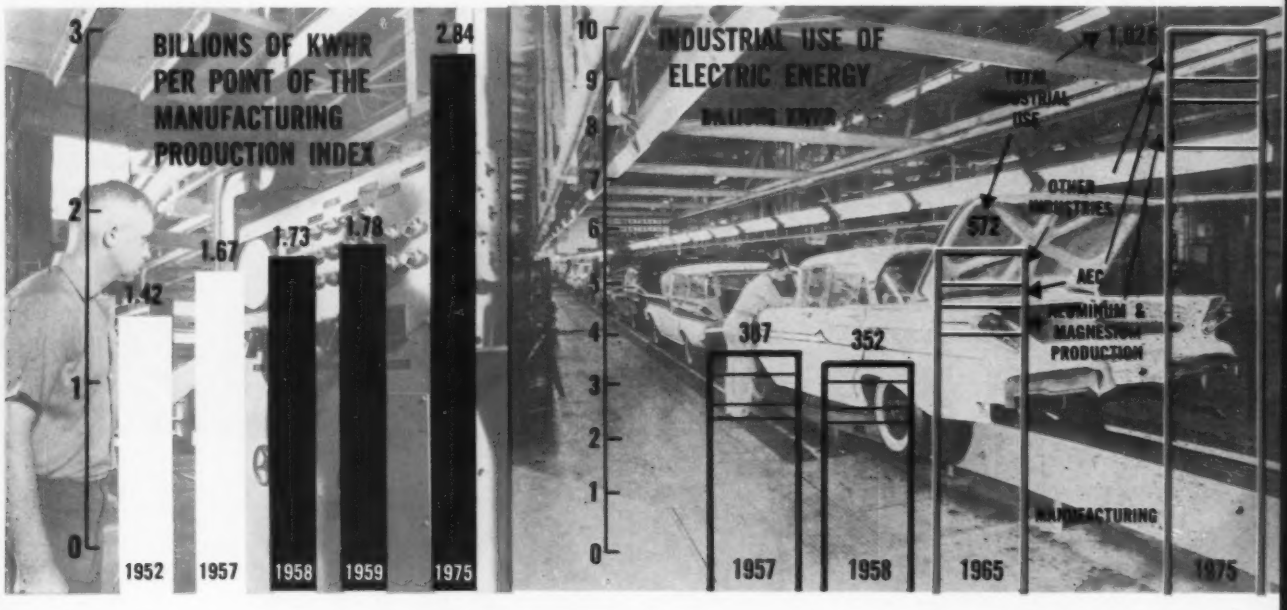
By 1975 a 191% increase over last year will put use per manhour at 26.5 kwhr.

Even in recession years such as 1958 gains are registered in per point use of electricity by industry. In fact, the rate of gain even accelerates somewhat though no gains are chalked up for labor productivity. This is brought about by a number of factors.

For one thing even though production declines there is certain base load for industrial plants such as heating, lighting, air conditioning etc., which stays fairly constant or may possibly even grow.

In addition although industrial capital expenditures have been cut back there is still a considerable amount of money being spent on new plant and equipment. And a greater proportion of this is going for modernization of production facilities.

With profit margins dwindling because of greatly increased competition and rising labor and material costs, it's a safe bet capital expenditures will pick up in the near future thus assuring near-term increases in use of electricity.



Overcome '58 Dip of 3.7%

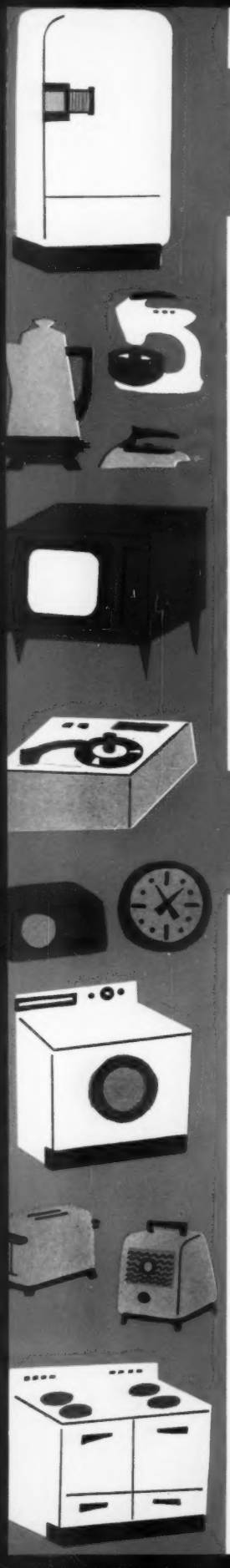
both metals will take only 28.3 billion kwhr compared with 31.3 billion kwhr last year.

These cutbacks will chop total industrial use 4.1% to 352 billion kwhr from last year's high of 367 billion kwhr. Of this total, 77% or 272.2 billion kwhr will be supplied by the electric utility industry—11 billion kwhr or 3.7% less than last year. The remaining 23% or 79.8 billion kwhr will be supplied by industrial plants themselves.

As dour as 1958 results may seem at the moment, they are really basically encouraging as far as the near term outlook for the industry is concerned. In essence what has happened is that a 7% drop in industrial activity dropped industrial use of electricity only 4.1%.

With economists predicting a 9% pickup in industrial production, next year utility industrial sales of electricity should jump 10.4% to 300.5 billion kwhr—6.3% better than 57's high of 283 billion kwhr.

By 1975 industrial sales will climb 205% over 1957 to 863 billion kwhr while total industrial use hits 1.0 trillion kwhr.



Indices of Industrial Activity

	Industrial Production 1947—49—100	Manufacturing Production 1947—49—100	Manufacturing Manhours billions	Primary Aluminum Production thousand tons	Primary Magnesium Production thousand tons
1948	104	103	26.5	623	10
1949	97	97	23.6	603	12
1950	112	113	25.9	719	16
1951	120	121	27.9	837	41
1952	124	125	27.7	937	106
1953	134	136	29.1	1,252	93
1954	125	127	26.0	1,461	70
1955	139	140	27.7	1,566	61
1956	143	144	27.7	1,679	68
1957	143	145	26.7	1,649	81
FORECAST					
1958	**133**	**135**	**23.4**	**1,510**	**55**
1959	**145**	**147**	**26.2**	**1,646**	**65**
1960	**155**	**157**	**27.2**	**1,800**	**75**
1961	**161**	**163**	**27.3**	**2,025**	**85**
1962	**167**	**169**	**27.3**	**2,250**	**94**
1963	**174**	**176**	**27.4**	**2,550**	**110**
1964	**181**	**183**	**27.4**	**2,800**	**128**
1965	**188**	**190**	**27.5**	**3,050**	**146**
1970	**223**	**226**	**28.5**	**3,650**	**246**
1975	**269**	**272**	**29.1**	**4,250**	**296**

Industrial Use of Electric Energy (billion kwhr)

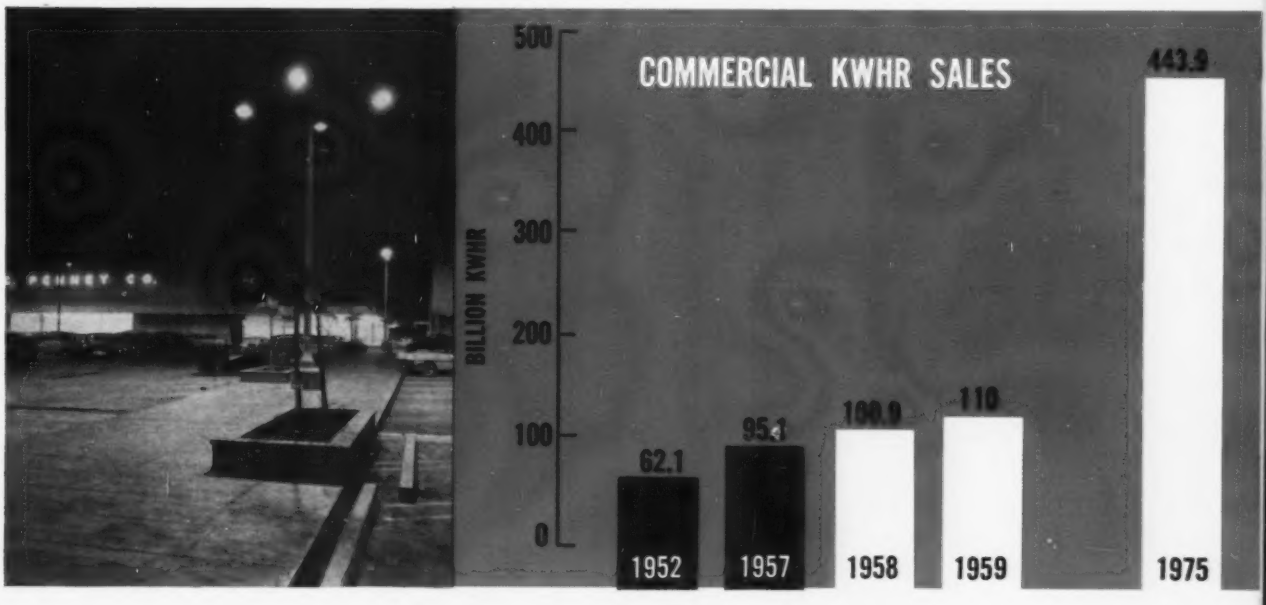
	Manufacturing Use	Aluminum and Magnesium	AEC Use	Other Industries	Total Industrial Use	Generation by Industrial Plants	Utility Industrial Sales
1948	144.6	11.4	2.3	19.9	178.2	54.1	124.1
1949	139.7	11.1	2.2	21.7	174.7	54.0	120.8
1950	157.9	13.3	2.5	24.9	198.6	59.5	139.1
1951	174.8	15.8	3.7	26.2	220.5	62.7	157.8
1952	177.7	18.7	6.7	28.1	231.2	63.8	167.4
1953	195.3	24.3	12.5	29.4	261.5	71.5	190.0
1954	192.1	27.7	23.4	30.0	273.2	73.0	200.2
1955	222.2	29.4	46.6	33.0	331.2	82.0	249.2
1956	235.0	31.6	57.8	36.3	360.7	84.1	276.6
1957	242.2	31.3	56.6	36.9	367.0	84.3	282.7
FORECAST							
1958	**233.8**	**28.3**	**54.6**	**35.3**	**352.0**	**79.8**	**272.2**
1959	**261.2**	**30.9**	**54.6**	**38.3**	**385.0**	**84.5**	**300.5**
1960	**286.2**	**33.9**	**54.6**	**41.1**	**415.8**	**89.0**	**326.8**
1961	**306.1**	**38.2**	**54.6**	**44.1**	**443.0**	**91.7**	**351.3**
1962	**326.8**	**42.4**	**54.6**	**47.3**	**471.1**	**94.1**	**377.0**
1963	**350.6**	**48.1**	**54.6**	**50.7**	**504.0**	**96.8**	**407.2**
1964	**375.5**	**53.0**	**54.6**	**54.4**	**537.5**	**99.1**	**438.4**
1965	**401.7**	**57.8**	**54.6**	**58.3**	**572.4**	**101.2**	**471.2**
1970	**553.5**	**70.6**	**54.6**	**82.5**	**761.2**	**126.5**	**634.7**
1975	**772.2**	**82.4**	**54.6**	**116.7**	**1,025.9**	**163.3**	**862.6**

Average Commerical Use Up 4.9% in 1958

New commercial customers will result from our rising population. More consumers buying more goods mean more office buildings, restaurants, and retail stores. In fact, there will be so many retailers they will use more electricity to better the competition through improved lighting and year-round air conditioning.

Use by commercial customers already reflects this trend. This year the average commercial customer will use 16,182 kwhr —4.9% more than last year and 6,862 kwhr or 74% more than 1950.

Commercial sales in 1958 will top 1957's 95.1 billion kwhr by 6.1%. An 8.5% gain next year will boost the total to 109.5 billion kwhr. By 1975 sales will jump 367% to 444 billion kwhr.



Commercial and Other Sales

	Commercial Customers thousand	Average Annual Use per Customer kwhr	Commercial Sales billion kwhr	Rural Sales billion kwhr	Street & Highway Lighting Sales billion kwhr	Other Public Authority Sales billion kwhr	Railway & Railroad Sales billion kwhr	Inter-departmental Sales billion kwhr
1948	5,132	8,535	43.2	6.3	2.5	6.3	6.7	0.7
1949	5,291	8,871	46.3	7.4	2.7	6.6	6.1	0.6
1950	5,466	9,320	50.4	7.4	3.0	7.2	5.9	0.6
1951	5,528	10,432	57.3	8.5	3.3	8.0	5.8	0.5
1952	5,634	11,106	62.1	8.5	3.5	8.4	5.4	0.5
1953	5,863	12,007	69.2	9.6	3.8	9.0	5.0	0.6
1954	5,992	12,353	73.4	10.2	4.0	9.4	4.7	0.6
1955	6,042	13,422	80.8	10.8	4.4	10.2	4.6	0.6
1956	6,125	14,395	87.7	11.1	4.7	11.0	4.4	0.6
1957	6,187	15,432	95.1	11.3	5.1	11.8	4.1	0.6
FORECAST								
1958	6,282	16,182	100.9	11.0	5.5	12.6	3.9	0.6
1959	6,386	17,282	109.5	11.3	6.0	13.5	4.0	0.6
1960	6,510	18,457	119.0	11.7	6.5	14.5	4.0	0.6
1961	6,654	19,712	129.7	12.0	7.0	15.5	4.0	0.6
1962	6,818	21,052	141.8	12.4	7.7	16.6	4.0	0.6
1963	7,002	22,484	155.4	12.8	8.3	17.8	4.0	0.6
1964	7,260	24,013	171.2	13.1	9.0	19.1	4.0	0.6
1965	7,430	25,646	188.4	13.5	9.8	20.4	4.0	0.6
1970	8,290	35,467	291.0	15.7	14.9	26.7	4.0	0.6
1975	9,226	48,593	443.9	18.2	22.6	34.6	4.0	0.6

Sales Up 1.8% in '58; Will Climb 9.5% in '59

Total energy sales by the nation's electric utilities will increase about 1.8% in 1958 to 568 billion kwhr. Renewed economic growth will push utility sales up 9.5% to 622 billion kwhr in 1959 and another 8.9% in 1960 to 677 billion kwhr.

By 1975 electric utilities will realize total annual sales of almost 2.1 trillion kwhr —an increase of 275% over last year.

And the percentage of each customer group's share of the total will change by 1975. Residential sales will contribute 33.8% of total sales in 1975 compared with 26.4% last year. This will be at the expense of "industrials" share which will dip to 41.2% from last year's 50.7%.

Total Electric Energy Sales (billion kwhr)

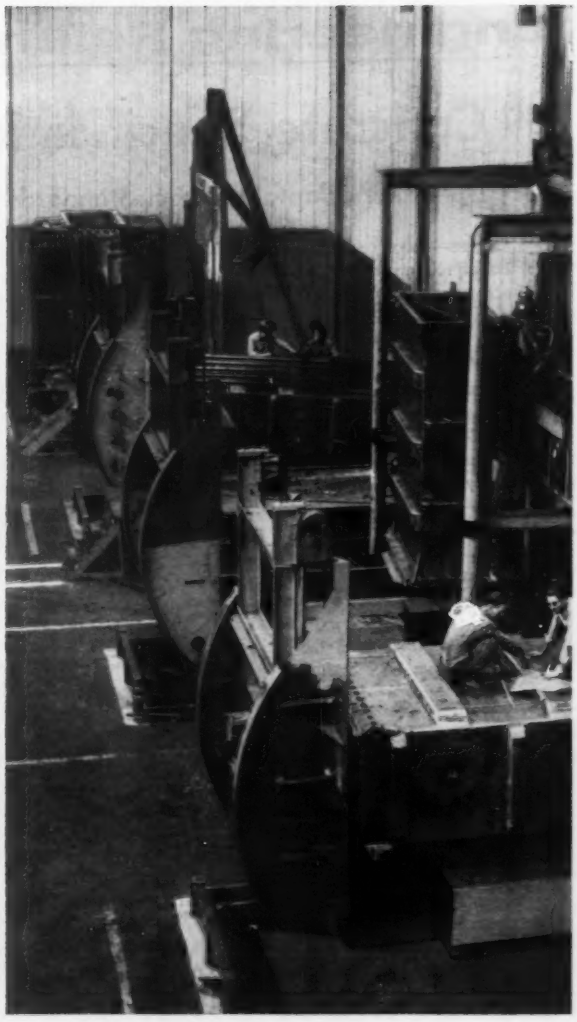
	Residential		Industrial		Commercial		"Other"		Total
	Sales	(% total)	Sales	(% total)	Sales	(% total)	Sales	(% total)	Sales
1948	51.0	21.2	124.1	51.6	43.2	17.9	22.5	9.3	240.7
1949	58.1	23.4	120.8	48.6	46.3	18.6	23.4	9.4	248.5
1950	67.0	23.9	139.1	49.5	50.4	18.0	24.0	8.6	280.5
1951	77.0	24.2	157.8	49.6	57.3	18.0	26.0	8.2	318.2
1952	86.8	25.3	167.4	48.9	62.1	18.1	26.3	7.7	342.5
1953	97.0	25.2	190.0	49.5	69.2	18.0	28.0	7.3	384.2
1954	108.5	26.4	200.2	48.7	73.4	17.9	28.9	7.0	410.9
1955	120.5	25.1	249.2	51.8	80.8	16.8	30.4	6.3	480.9
1956	133.9	25.3	275.7	52.1	87.7	16.6	31.9	6.0	529.2
1957	147.1	26.4	282.7	50.7	95.1	17.0	32.9	5.9	557.9
				FORECAST					
1958	161.2	28.4	272.2	47.9	100.9	17.8	33.6	5.9	587.9
1959	176.3	28.4	300.5	48.3	108.5	17.6	35.4	5.7	621.7
1960	193.8	28.6	326.8	48.3	119.0	17.6	37.2	5.5	676.8
1961	212.9	29.0	351.3	47.9	129.7	17.7	39.2	5.3	733.1
1962	233.4	29.4	377.0	47.5	141.8	17.9	41.3	5.2	793.5
1963	256.9	29.7	407.2	47.2	155.4	18.0	43.5	5.0	862.1
1964	280.3	30.0	438.4	46.9	171.2	18.3	45.8	4.9	935.7
1965	306.4	30.2	471.2	46.5	188.4	18.6	48.4	4.8	1,014.4
1970	470.6	32.3	634.7	43.5	291.0	20.0	61.9	4.2	1,458.2
1975	707.7	33.8	862.6	41.2	443.9	21.2	80.1	3.8	2,094.3

Comparison of Electrical World and Federal Power Commission Forecasts

	Output (Billions Kwhr)		Peak Loads (Millions Kw)		Generating Capacity (Millions Kw)	
	FPC	EW	FPC	EW	FPC	EW
1957	638	627	114.4	106.9	128.7	130.6
1960	802	764	147.2	137.3	164.0	169.7
1965	1,044	1,149	191.5	195.1	215.0	238.0
1970	1,298	1,655	238.3	276.2	269.0	337.0
1975	1,573	2,380	288.7	391.0	329.0	477.0

Note: 1. FPC output, peak loads and capability are total industry. Electrical World data is for Class I systems representing more than 98% of the industry.

Eliminating "job-shop" fabrication . . .



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1. Scope—These specifications cover the use of reinforced and plain concrete in structures requiring strengths up to 3,000 lb per sq in. at 28 days.

MATERIAL AND MIXES

2. Cement—A standard brand of Portland cement conforming to A.S.T.M. Specification C-150, and approved by the engineer shall be used. Type II cement shall preferably be used for ordinary concrete and Type V for concrete in contact with sea water or highly active soils or other materials.

3. Sand—Sand shall be sharp, clean, and pass a No. 4 sieve, and not less than 92% shall be retained on a 100-mesh sieve. It shall satisfactorily pass the sodium sulphate soundness test, and shall not contain more than 2% of soft or deleterious material. It shall show a mortar strength ratio of at least 90%, and a color not greater than plate 1.5 in the standard colorimetric test for organic matter.

4. Coarse Aggregate—Coarse aggregate shall pass a 1.5-in., 1-in. or 0.5-in. screen (see table, column 4) and shall be retained on a 0.25-in. screen. Coarse aggregates shall pass the sodium sulphate soundness test and shall not contain more than 2% of soft or otherwise harmful material.

5. Water—Water other than from a municipal supply shall be subject to the engineer's test and approval as to cleanness and freedom from injurious amounts of oils, acids, alkalis, organic materials or other harmful substances.

6. Concrete Mixes—See accompanying table for mix volumes of cement, sand and coarse aggregate.—(C-S-CA).

Where actual designed mixes indicate a disparity between the water/cement ratio and slump, slump shall prevail.

For manhole floors, walls and roof slabs, use M7. It is noted, however, that M5 may be used for the walls and M7 for the floor and roof, if the use of two mixes is practical.

7. Waterproofing—This is provided by the density of the concrete, thickness of walls and care used in placing concrete. When structures less than 8 in. thick must be waterproofed, the engineers shall be consulted as to added cement content.

8. Mixing—Ready-mixed concrete shall be proportioned at the plant. Water shall be added and mixing shall be done at the job site, and mixing shall continue for a minimum of 1.5 min and a maximum of 60 min.

9. Tests—Purchaser reserves the right to test at any time the materials and concrete furnished by the ready-mix concrete vendor.

10. Inspection—Ready-mix concrete vendor's plant equipment and procedure shall be subject to the approval of the engineer.

11. Ordering of Ready-Mixed Concrete—Ordering shall be in accordance with these specifications and a copy of same supplied to the vendor. Amount in cubic yards, delivery point, time schedule and proper mix number for the particular application shall be specified on the order.

12. Size of Shipment—Delivery of concrete in unit amount in excess of the rated capacity of the mixer shall be cause of rejection of that shipment.

PLACEMENT AND PROTECTION

13. Placing Concrete—Walls are to be poured only upon cleaned surfaces, to prevent leakage at joints.

Where conditions, such as close spacing of reinforcing, make it difficult to get uniform and compact concrete at the bottom of the forms, batches of mortar containing the same proportions of cement to sand as used in the concrete shall be deposited in the forms first, and spread over the cleaned surface to a depth of about one inch.

Concrete shall not be permitted to fall from the end of the chute or tube more than 5 ft to the point of deposit.

14. Curing—After placing, concrete shall be maintained in moist condition for at least 7 days for normal concrete, and at least 3 days for high-early strength concrete.

15. Stripping of Forms—Forms shall be removed in a manner to insure complete safety of the structure, and protection from damage. With normal concrete, forms may be removed not sooner after the mixture placement than: 7 days for supported floor and roof slabs; 48 hr for walls and columns; 24 hr for footing walls and piers, and 12 hr for underground duct lines. If high-early strength cement is used, the time periods may be reduced by 50%.

16. Loading of Concrete—Normal concrete structures shall not be subjected to external loads in less than: 96 hr for foundations and manhole floors and walls, and in less than 7 days for structures supported above ground, such as floors, roofs and columns. If high-early strength cement is used these time periods may be reduced by 50%. Each placement of concrete shall be allowed to set at least 48 hr before the addition of a subsequent pour.

17. Cold Weather Protection—In case the air temperature falls below 40 F during the period of delivery, concrete shall be delivered at a temperature in excess of 70 F.

Concrete shall not be placed when the temperature is below 40 F, unless protection is provided so that none of the concrete in place will have a temperature below 50 F for a period of 7 days.

Concrete shall not be placed when air temperatures will be below 20 F without the permission of the engineer.

18. Surface Finish—Exposed concrete surfaces shall not be given any special treatment for appearance, such as rubbing with a stone, without the engineer's permission.

Concrete Mixes for Typical Line Uses

Mix No.	Strength Min. 28 Day, lb/sq in.	Mix Volumes Approx., C, S, CA	Agg. Max. Size, in.	Cement, Bags per Cu yd of Concrete	Water, Gal. per Bag Cement	Slump Not More Than, in.	Typical Uses
M1	2,000	1–3–5	1.5	4.5	6	4	Pile Caps & Floor Fill
M2	2,000	1–3–5	0.5	5	6	2	Duct Lines—Tier Method
M3	2,000	1–3–5	0.5	5	8	6	Duct Lines—Unit Method
M4	2,500	1–2½–4½	1.5	5	6	4	Footings & Slabs on Ground
M5	2,600	1–2½–4	1.5	5.5	5	4	Foundation Walls
M6	2,600	1–2½–4	0.5	5.5	6	6	Cell Walls & Conduit Casings
M7	3,000	1–2–3¼	1	6	5	4	Floor & Roof Slabs on Forms

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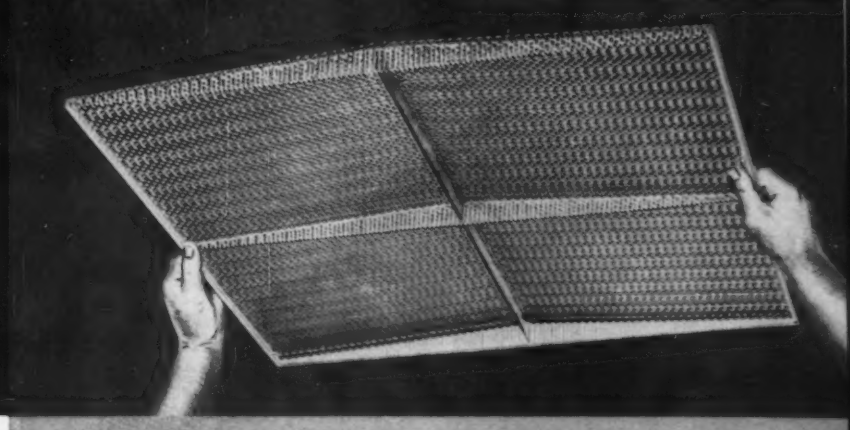

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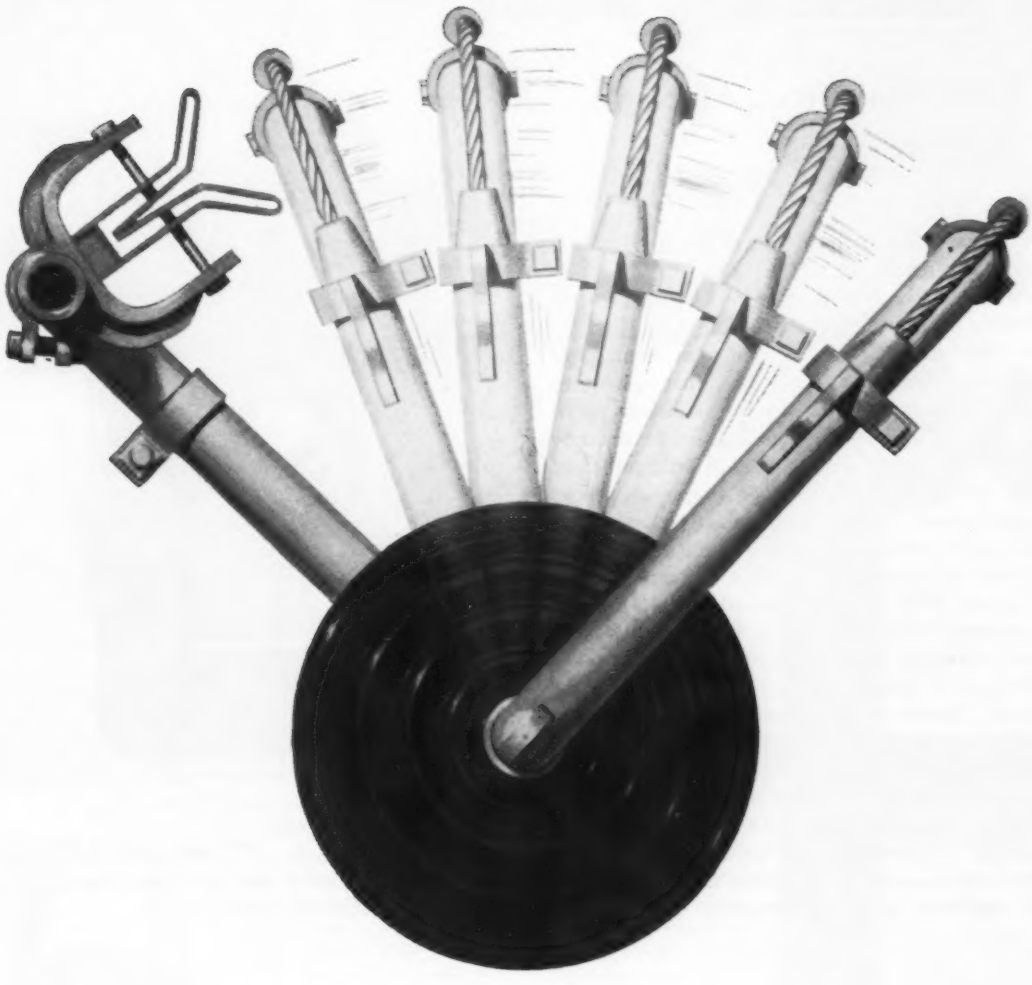

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Manufacturers News

P-T Reduces Prices of LTC Transformers

Prices have been reduced on load tap changing transformers in ratings 10,000 kva and smaller, 69 kv and below, effective Sept. 15, 1958, by Pennsylvania Transformer Division, McGraw-Edison Co.

W. R. Swoish, vice president and sales manager of Pennsylvania Transformer, indicated that this price reduction is a direct result of the developments of an entirely new load tap changing mechanism designed by Pennsylvania engineers around the direct drive principle. This new design he said is a much simpler but more rugged mechanism than can be manufactured at a lower cost than small spring drive units. Swoish stated that these savings in manufacturing costs amounting to between 10 and 15% are being passed on to the users. As an example of the savings to be realized by this new price reduction, Swoish indicated that a 10,000 kva and 69 kv, LTC Pennsylvania transformer would be offered at a saving of approximately $8,500.

Swoish also stated that he hopes such lower prices will stimulate the purchase of load tap changing transformers which Pennsylvania is now offering at the lowest prices in several years. These lower prices for automatic LTC transformers in these ratings, he said, will allow electric utilities to obtain better distribution system regulation more economically and improve service to their customers.

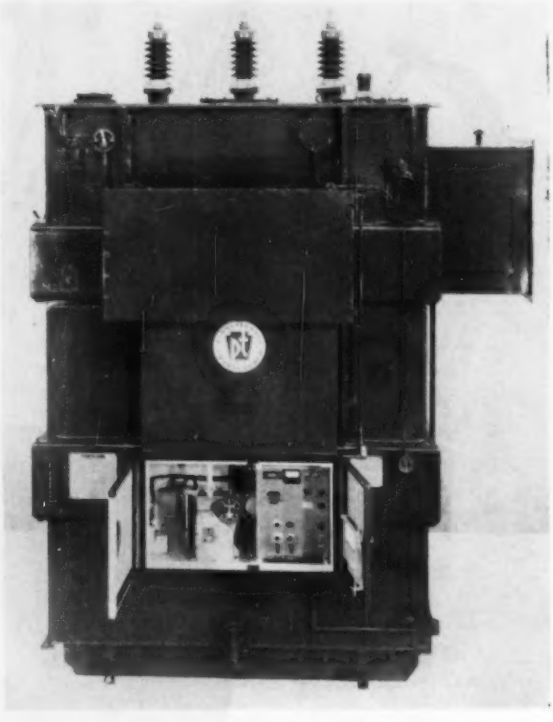
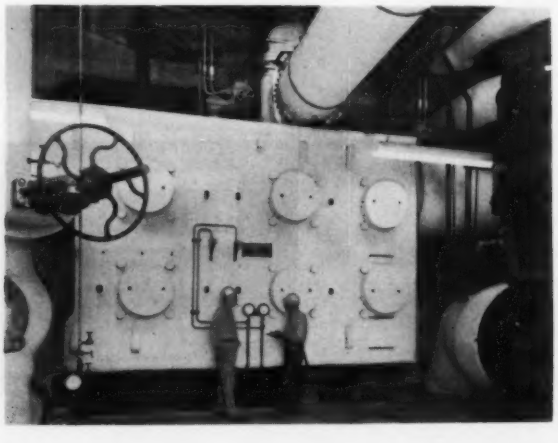


Illustration shows an LTC unit rated 5,000/6,250 kva with panel, motor and gear box mounted in a compartment below the switch.

Large and Welded-Tube A-C Condensers Started

A 180,000-sq ft condenser, consisting of two 90,000-sq ft single pass condensers, and another steam condenser in which tubes are welded have gone into operation.



A 180,000-sq ft condenser recently went into operation with Unit No 7 at the Waukegan, Ill., generating station of Commonwealth Edison Co. Made by Allis-Chalmers Mfg Co, it serves a 325-Mw turbine-generator at the station and is reportedly the world's largest operating condensing unit. See illustration.

Two 90,000-sq ft single pass condensers make up the unit. Aluminum tubes, instead of copper alloy, are used in the condensers. The previous record holder consisted of eight 22,000-sq ft condensers (a total of 176,000 sq ft of condensing area) installed at the State Line Generating Station at Hammond, Ind.

Allis-Chalmers furnished four circulating and three condensate pumps for this unit. They are rated 67,000 and 1,050 gpm respectively. The water boxes are divided, making a total of four sections with one pump for each section. However, valve connections are unique for a unit of this size. At low loads or low water temperature it is reported water can be circulated through the entire unit by three, two or only one pump.

(Continued on page 124)

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They're designed for each other! RODS are completely copper armored . . . safe from corrosion. Rigid steel core and sharp point make driving easy. The CLAMPS grip firmly . . . hold connections under extreme pressure permanently. Rounded screw point prevents rod damage.

POLE BOTTOM GROUND PLATES
. . . have 25% larger copper area than other commonly used plates. That means: greater conductivity—better overload dispersal. Solderless connector with vibration-proof lock washer assures high pressure contact that stays tight *for keeps.*

GROUND CLAMPS (UL APPROVED)
Cast in bronze for complete resistance to rust and corrosion. They're easy to use and make permanent ground connections. The only complete line of bronze clamps for ¼" to 4" pipe. Competitively priced.

WRITE TODAY FOR SAMPLES AND CATALOG

J. A. WEAVER Company

2110 HOWARD ST. • ST. LOUIS 6, MO.

Telephone Central 1-8100

(*Continued from page* 122)

A steam surface condenser in which tubes are welded, instead of rolled into the tube sheets, is said to be the first of its kind. It has gone into operation at the Frank M. Tait station of The Dayton Power & Light Co. This unit, manufactured by Allis-Chalmers, is a 90,000-sq ft two-pass condenser that is installed with the utility's 130-Mw steam turbine Unit No. 4.

Due to the trend to higher boiler pressures, nuclear power developments, and once-through boilers, welded tube type construction is being used to attain the tightest possible joints between tubes and tube sheets. This prevents leakage which could lead to boiler failures and faulty turbine operation.

The new unit has a sub-critical once-through boiler that requires a steam by-pass system. Unit No. 5 at the Tait station will be identical and will go into service early in 1959. All five condensers at the station were supplied by Allis-Chalmers.

Anaconda-Jurden Formed as Engineering Subsidiary

Anaconda-Jurden Associates Inc has just been formed as a new subsidiary of The Anaconda Co, New York, according to Clyde E. Weed, chairman of Anaconda. The new company, formerly the engineering department of the parent, offers a service in the planning, designing, engineering and construction of industrial plants of major size. Wilbur Jurden has been named president and chief engineer of the new concern, and Herman H. Boschen has been designated vice president and assistant to the chief engineer. The new subsidiary's headquarters are located at 26 Broadway, New York.

The former Anaconda engineering department is a completely integrated unit which, since World War II, has designed and constructed reportedly more than a billion dollars of metallurgical and industrial plants in the western hemisphere. These facilities include not only plants erected for Anaconda and its numerous subsidiaries, but also a huge, commercial taconite plant for Erie Mining Co in Minnesota and

(*Continued on page* 126)

99.6%
SURE

Of all manufacturers of power capacitors only C-D puts each and every unit through a full voltage energization test before shipment to you. This is why C-D delivers an unbeatable 99.6%-sure performance

PERFORMANCE

in the field.

15, 25, 33.3, 50 and 100 KVAR capacitors for every application with lowest dielectric unit stress and highest major insulation level. Invest your purchasing dollar in internal quality—the only place where it counts. See your C-D representative or write Cornell-Dubilier Electric Corp., Dept. EW-9, South Plainfield, N. J.

SPECIFY

Consistently *Dependable*

CORNELL-DUBILIER

POWER-FACTOR CAPACITORS

PUT 'EM DOWN BY MACHINE to cut anchoring costs!

Many utilities have found that anchor installation time and costs can be cut to the minimum by installing Chance Screw Anchors with their hole boring machines. They use the Chance "Blackfoot" because its special features—correct blade pitch, small hub, large thimbleye—were designed for use with boring machines. These features also mean greater holding power and easier installation of these anchors when they are screwed down by hand.

the CHANCE "BLACKFOOT"*

***the line crew's name for the line crew's choice.**

–King-size thimbleye accommodates big turning bar or boring machine adaptor.

–Smaller hub means less earth disturbed during installation. Adds to holding power.

–Blades are accurately "pitch-controlled" for fast-cutting, speedy installation.

Chance Screw Anchors are available in sizes from 4" to 15" in diameter. You can get them from stock from your anchor distributor.

. . . and there are CHANCE ANCHORS for all other soil and guying conditions . . .

CA58-5

A·B·CHANCE CO· **CENTRALIA MISSOURI**

(A·B·CHANCE CO. of Canada, Ltd., Toronto)

Anaconda-Jurden

(*Continued from page* 124)

numerous key installations tor Phelps Dodge Corp in both Arizona and California.

Jurden said that over the years the projects under his direction have entailed not only the design of the plant proper, but also such adjuncts as power plants, complete townsites, bridges, road systems, warehouses, offices, laboratories, water supply and sewage disposal systems.

Presently under the new firm's supervision for design and construction are the $110,000 El Salvador sulphide copper plant project of Andes Copper Mining Co in northern Chile, Anaconda's $40,000,000 integrated aluminum fabricating plant in Terre Haute, Ind., Chile Exploration Co's 50,000-kw 1800 psi plant at Tocopilla, and other projects.

Reduction in Precipitator Costs Believed Possible

New tests on the Koronamax electrode produced by Koppers Co Inc, Baltimore, indicate that reduction in precipitator costs are possible. Koronomax wires will enable the unit to maintain desired efficiency on considerably greater dust loadings or achieve appreciably higher efficiency on existing loadings.

With the Koronamax electrode it is possible to distribute the current evenly throughout the length of the wire and to control the corona discharge to evenly-spaced points, according to the manufacturer. The net result is the ability to impose considerably greater current without causing a "flash-over."

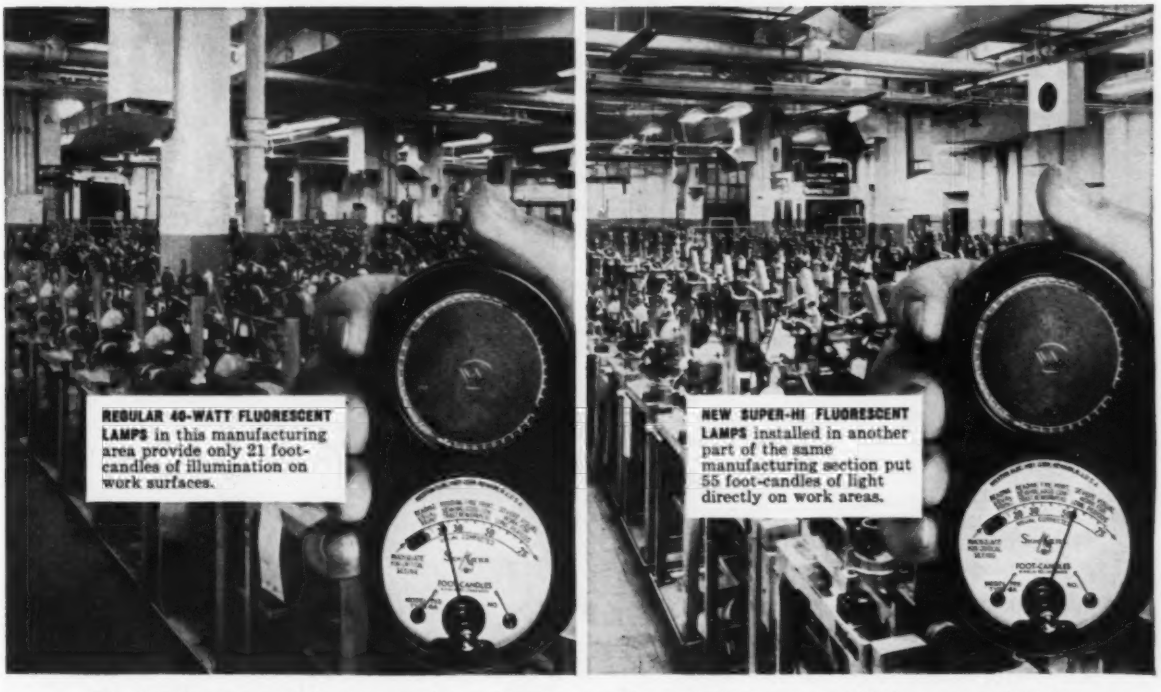
$2 Million Turbine Contract

A $2 million contract for constructing two hydraulic turbines for an East Pakistan hydroelectric power plant has been awarded to the Eddystone Division, Eddystone, Pa., of Baldwin-Lima-Hamilton Corp. Each turbine is rated 55,000 hp to operate at 68-ft head with provisions for operation up to 105-ft head. Delivery of the turbines and all accessories will be completed in 1959.

(*More Manufacturers News,* p 128)

NEW WESTINGHOUSE SUPER-HI™

FLUORESCENT LAMPS GIVE 2½ TIMES THE LIGHT OF ORDINARY FLUORESCENTS


REGULAR 40-WATT FLUORESCENT LAMPS in this manufacturing area provide only 21 foot-candles of illumination on work surfaces.
NEW SUPER-HI FLUORESCENT LAMPS installed in another part of the same manufacturing section put 55 foot-candles of light directly on work areas.

Westinghouse has developed a new Super-Hi fluorescent lamp that gives up to 2½ times as much light as regular fluorescent lamps . . . and nearly double the light of Hi-Output™ lamps. So now you can get much more light without increasing the number of fixtures. That means lower initial cost because you have fewer fixtures to buy . . . lower maintenance cost, too, because you have fewer fixtures to maintain. These powerful new lamps are ideal for medium and high bay industrial and outdoor lighting.

- **√ Special cooling chambers maintain proper vapor pressure to give longer life . . . more light.**
- **√ Longer life cathodes add to lamp life.**
- **√ New Chromium-Vanadium plating on lead wires retards end-darkening.**
- **√ Smooth slim design gives uninterrupted brightness all around the tube . . . much lighter weight for safe and easy handling.**
- **√ Interchangeable . . . can be used in any fixtures designed for new extra Hi-Output lamps.**
- **√ More reliable starting even in damp weather . . . special silicone coating over exterior surface of the lamp prevents collection of moisture.**

All Westinghouse fluorescent lamps have "Ultralume"™ phosphors to assure maximum brightness for the life of the lamp. There's one for every industrial, business and home use. Specify Westinghouse on every lamp order. Call your local authorized Westinghouse agent or write—Westinghouse Lamp Division, Bloomfield, N. J.

YOU CAN BE SURE...IF IT'S Westinghouse (W) FLUORESCENT LAMPS

READ THIS before you specify High Voltage Transmission Clamps or Hardware

BTC HI-LINE HARDWARE CATALOG

Contains valuable reference information, pictures, blueprints and complete specifications on BTC's entire line of DROP-FORGED Steel and Aluminum Hi-Line Hardware.

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Pioneers in Drop-Forged Hi-Line Hardware

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HI-LINE HARDWARE DIVISION
Cortland, New York

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COMPANY _____
STREET _____
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M-H Develops Frequency Type Telemetry System

A frequency type tubeless telemetering system for long-distance transmission and control of industrial process data has been developed by Brown Instruments Division of Minneapolis-Honeywell Regulator Co, Philadelphia, Pa.

The miniaturized system, using solid state components, withstands extremes of environmental conditions without loss of accuracy, according to the company.

This system is designed primarily for central station use in telemetering tie-line power, total station generation, and load frequency intelligence. It is equally useful in making rapid and accurate measurements of flow through natural gas and oil pipelines.

All types of communications channels can be used for transmission. The system consists of a transmitter and a receiver. The transmitter converts the millivolt signal of the sensing element to current and translates this into a transmittable frequency that is a measure of the original variable. The receiver converts the frequency back to current of millivolts for recording and control purposes.

Harvey Aluminum Starts Production at The Dalles

Harvey Aluminum, Torrance, Calif, has started regular production at its new aluminum reduction facility at The Dalles, Ore. Plant capacity is more than 100,000,000 lb a year.

The plant, located on the Columbia River 88 miles east of Portland, uses hydroelectric power generated at The Dalles Dam, 5 miles away, to produce pig, ingot, and billet.

The company will deliver its first commercial output of primary metal in approximately 60 to 90 days.

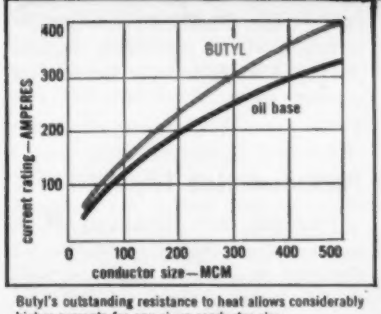
U. S. Aluminum Production

Primary aluminum production in the United States in July was 118,811 tons The Aluminum Association, New York, reports. The June total was 115,325 tons. The

(Continued on page 130)

ENJAY BUTYL

BEST WAY TO HANDLE ELECTRICITY



Butyl's outstanding resistance to heat allows considerably higher currents for any given conductor size.

Of all vulcanizable rubbers, Enjay Butyl offers the best electrical and dielectric properties. Butyl is the ideal material for wire and power cable, transformers, tapes, busbars and other insulation applications.

Butyl *also* offers outstanding resistance to weathering and sunlight . . . chemicals . . . abrasion, tear and flexing . . . superior damping properties . . . unmatched impermeability to gases and moisture.

Find out how this versatile rubber can improve your product. Call or write the Enjay Company, today!

ENJAY® BUTYL

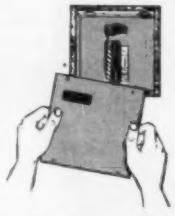
ENJAY *Pioneer in Petrochemicals*

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.

Akron • Boston • Charlotte • Chicago • Detroit • Los Angeles • New Orleans • Tulsa

1. Central control cabinet is eliminated.

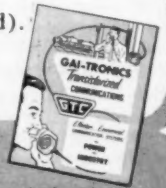
2. Loudspeaker Amplifiers and Handset Stations are "plug-in". Untrained personnel can replace a defective unit with a "spare" in minutes. Repairs can be made at the shop bench.



3. The inconvenience and expense of vacuum tube failure is completely eliminated. Unlike vacuum tubes, transistors indicate unlimited life and no deterioration in operation.

4. Because of transistors' much lower voltage requirements, GTC operates with much greater safety factor than vacuum tube equipment.

5. Ultra-simple wiring plan (no shielded cables used).



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A SUBSIDIARY OF GILBERT ASSOCIATES, INC., ENGINEERS AND CONSULTANTS

GTC is extremely flexible in application. Write today for a copy of our completely illustrated, descriptive booklet. It's yours free by return mail.

(Continued from page 128)

total for the year through July was reported as 881,372 tons. These figures compare with 142,041 tons in July, 1957 and 966,169 tons through July, 1957.

GE Reports on Tests and Plant Consolidation

• A 230-kv, oil-filled breaker opened a circuit of more than 15 million kva, reportedly the highest short circuit recorded during field tests. This dead short circuit was on the Pacific Northwest grid at Grand Coulee Dam power plant, during tests by Bonneville Power Administration and U. S. Bureau of Reclamation. Tests were conducted to interrupt power faults in $\frac{1}{20}$ sec at the breakers 15 million kva rating.

• Operations of the Communication Products Dept, now located in four New York state cities, will be consolidated in an existing plant in Lynchburg, Va. The latter faciilty was built in 1956 for production of rectifiers but this manufacturing will be transferred to an existing GE location in Philadelphia.

Power Show Scheduled for New York Coliseum

The 23rd National Exposition of Power and Mechanical Engineering will be held in conjunction with the 78th annual meeting of The American Society of Mechanical Engineers on Dec. 1 to 5. The exposition will be at the New York Coliseum.

A feature of the display will be a number of exhibits of heavy equipment built to customer specifications. One, a giant feedwater heater made for a power plant in New England, weighs 36,000 lb. Another innovation will be reportedly the first packaged water tube boiler seen at a power show.

Permacel Has Tape Kit

Permacel, New Brunswick, N. J, has a silicone rubber evaluation kit designed to acquaint engineers with the firm's line of tapes. The kit con-

(Continued on page 132)

NEW

JOINS 26% FASTER

Because there are no separate couplings to assemble on the job, Orangeburg's new CA Conduit lays faster—costs less to install. In addition, there are no coupling cartons to handle, transport or store.

Orangeburg's new CA Conduit comes, at *no extra cost*, with a factory-attached coupling at one end and a standard 2° male taper at the other end. To join—CA's long, lightweight lengths are placed end to end—hammered home in a simple, one-step operation. Actual installations *prove* Orangeburg's new CA Conduit joins up to 26% faster!

What's more, because the attached coupling is *flush* with the outside diameter of the conduit, new CA Conduit is easy to handle and store in neat, even stacks. And with the new flush coupling there's no need to "stagger" conduit joints in the trench. That means less cutting and tooling time.

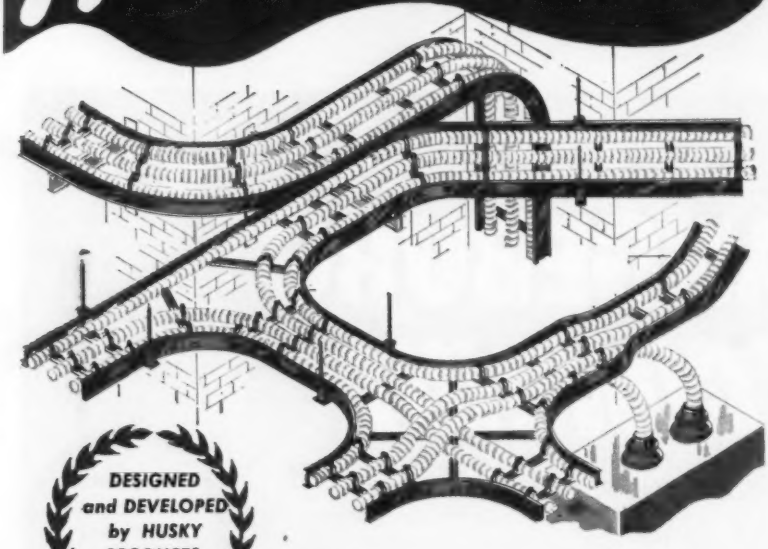
New CA Conduit—like the millions of feet of Orangeburg Fibre Conduit in use since 1893—has self-sealing joints and impermeable walls that make it absolutely watertight. Its smooth 100% fibre raceway adds years to cable life.

Specify new CA Conduit on your next job. This addition to Orangeburg's line is available in 2", 3", 4", 4½" and 5" sizes. Orangeburg's Standard and Nocrete Conduit with separate sleeve couplings are available as always. Orangeburg Manufacturing Co., Inc., Orangeburg, N. Y. and Newark, Calif.

Orangeburg Fibre Conduit is distributed by Graybar Electric Co. and General Electric Supply Co. with branches and stocks in principal cities.

HUSKY SUPPORT SYSTEMS

FOR POWER and CONTROL CABLES IN-FREE-AIR



DESIGNED and DEVELOPED by HUSKY PRODUCTS, INC.

Each cable carrier type listed below is made from high strength, corrosion resistant aluminum alloy extrusions or roll formed steel, hot dip galvanized after fabrication. Companion fittings (bends, tees, etc.) are available to make a complete multi-directional installation.

HUSKY CABLE RACKS (Illustrated)

USE: Support of multiple power and/or control cables.

DESCRIPTION: All-welded construction. Cross rungs on 18 inch centers. Furnished in two (2) depths for 12 or 20 foot spans. Lengths up to 24 feet.

HUSKY CABLE BASKETS

USE: Where continuous bottom is required for support of multiple control cables.

DESCRIPTION: Continuous expanded metal or solid bottoms set on cross yokes. Furnished in several depths. Lengths up to 16 feet.

HUSKY CABLE TROUGHS

USE: Support of individual power and/or several control cables.

DESCRIPTION: One piece construction. Lengths up to 16 feet.

HUSKY CABLE TRAYS

USE: Support of multiple control cables where continuous bottom is NOT required.

DESCRIPTION: All-welded construction. Cross rungs on 9 inch centers. Lengths up to 24 feet.

HUSKY A SINGLE SOURCE OF SUPPLY

Auxiliary to the basic cable carrier types Husky Products offer a wide range of accessory materials which include:

A. Component parts for cable carrier support assemblies.
B. Long span support (channel beams, towers, etc.)
C. Cable fastening devices (clamps, insulator blocks, etc.)
D. Cable installation tools (EZ rolls, triple pulleys, etc.)

Write NOW for FREE Complete CATALOG and ILLUSTRATED BROCHURE!

HUSKY PRODUCTS, INC.

(Continued from page 130)

sists of sample rolls of six silicone rubber tapes—three standard products and three new tapes currently released for sale. Included is literature listing properties, shelf life, characteristics and uses of the company's silicone rubber tapes. Requests for additional information and kit price should be addressed to Dept E of company.

MANUFACTURERS BRIEFS

Anderson Connector Corp, a subsidiary of Anderson Electric Corp, Birmingham Ala., has opened a new office-warehouse at Lebanon Rd, Route 885, W. Mifflin Borough, Pa, outside of Pittsburgh. They were at 4135 Brownsville Rd.

Babcock & Wilcox Co, Beaver Falls, Pa. has inaugurated an electronic communication system which uses perforated tapes to transmit and receive messages. It links 17 Tubular Products division plants and district sales office over a 3,824-mile network.

Federal Pacific Electric Co, Newark, N. J. has been awarded a $132,600 contract to supply 15-kv outdoor-type metal-clad switchgear for the Tennessee Valley Authority's Wilson Dam in Sheffield, Ala.

Pyle-National Co, Chicago, Ill, manufacturer of electrical connectors, fittings and lighting equipment, has contracted to acquire the Steber Manufacturing Co, Broadview Ill, a producer of outdoor lighting fixtures and lighting equipment. Steber will continue its operations as a division of the Pyle-National organization.

Rome Cable Corp, Rome N. Y. has been assigned a United States patent for Roseal, a polyethylene butyl rubber resin used primarily as a sheathing compound on electrical wires and cables. The patent was granted to Rudolph A. Schatzel, vice president of engineering and research director of Rome Cable.

GET THE INSIDE STORY...

THIS NEW 8-PAGE BOOKLET TELLS WHY **ROEBLING TELLURIUM LEAD ALLOY SHEATH** LASTS LONGER!

90% less creep... 4½ times greater bending life... unusual stability under heat... negligible age-hardening—you've read how Roebling Tellurium Lead Alloy Cable Sheath has all these favorable, life-saving qualities, and more. Now the full story, complete with useful technical data, is told in an illustrated 8-page bulletin that's free for the asking.

Learn how cable maintenance problems can be materially reduced, with savings. Send for your copy of this informative book today!

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Electrical Wire Division
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Please send me your new Tellurium Lead Alloy Sheath Facts Book.

Name_____ Title_____

Company _____

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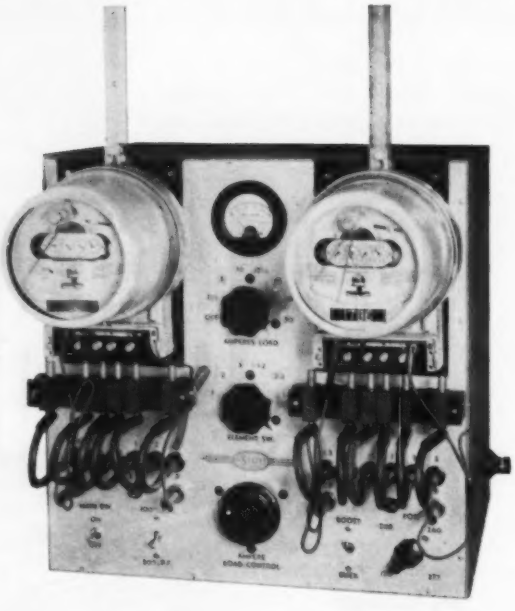
City_____ Zone____ State____

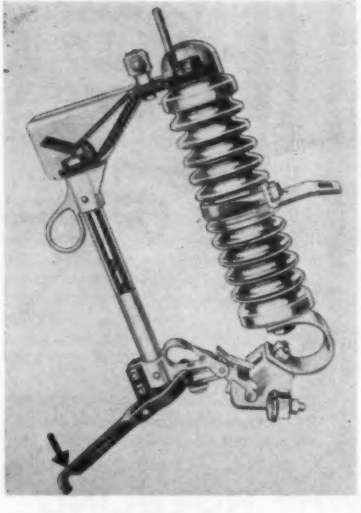
New Equipment

Demand Meter Test Table...



. . . provides proper loading for one demand meter and one reference meter. It can be used to test either bottom terminal (A) type single and polyphase meters or socket (S) type single-phase meters. Furnished with 8.5-v loading transformer built-in wattmeter, and ampere regulator, it maintains desired loading throughout test run. Capacity of this form DMS test table is 50 amp. Potential at the panel is 120/208/240/277 v.

The States Co, 19 New Park Ave, Hartford, Conn.



Load Break Lever . . .

. . . can be attached to any Faultmaster cutout, in a matter of minutes. Equipped with this lever, the cutout becomes a safe, positive load interrupter under any rated load. Lineman can break fuse link by pushing up with hook-stick on end of mechanical lever. Unit is safe because lineman's spurs are more deeply imbedded with upward thrust of hook-stick, which maintains tight, positive contact with load break lever.

Hubbard & Co, 200 S. Michigan Ave, Chicago 4, Ill.

Suspension Insulators . . .

. . . rated 25,000 lb have high compression grey glaze, permitting user to distinguish them at a glance from the 15,000-lb mahogany colored units. This grey glaze has the same high impact and mechanical strength as the conventional mahogany glaze. Development simplifies identification in warehouse, line truck, field assembly, or on line in service.

General Electric Co, Insulator Dept, P.O. Box 57, Baltimore 3, Md.

Service Ground Test Set

. . . checks resistance of secondary service and tests potential transformers on transformer rated metering installations. Instrument consists of suppressed zero-type voltmeter with 60-ohm shunt. Voltmeter has ranges of 65-130 and 130-260 and can be used to check service voltage independently of ground test. To facilitate reading, voltmeter scale is divided into three different colored sectors, with dividing lines corresponding to ground resistance of 24 and 8 ohm. In potential transformer checks, burden on secondary is 240 va at 120 v.

Eastern Specialty Co, Phila. 40, Pa.

Temperature Sensor . . .

. . . for monitoring temperature of large rotating machinery has noninductive bifilar wound resistance element which is insensitive to strain guage effect. Three high-temperature insulated leads are provided for bridge connection independent of lead wire resistance. It will operate in temperature ambients of −55 to + 150 C for unlimited time. Resistance element is standard 10 ohm, ± 0.02 ohm at 25 C, with resistance change of 0.00385 ohm per ohm per degree C. Measuring 0.078 in.

(Continued on page 138)

1 RATIO AND POLARITY TEST. The standard ASA ratio test to which we subject the coil and taps of every Delta-Star Distribution Transformer determines the precise turn ratio of primary and secondary windings, and can detect even a single-turn error. Polarity is checked at same time.

2 EXCITATION-LOSS AND IMPEDANCE TEST. On instruments accurate to within .75%, each assembled unit undergoes rigid tests in these categories. Strict quality control throughout manufacture assures you a transformer of maximum efficiency and working life. Actual impedance appears on nameplate to nearest tenth of one percent.

3 IMPULSE TEST. This *special* dielectric test, included as a further guarantee of Delta-Star Transformer quality, impresses a standard 1½ x 40 wave on each primary lead at the basic impulse level of the highest rated voltage. An oscilloscope monitors the test, retaining impulse images for critical observation and/or photographing.

4 INSULATION - POWER - FACTOR TEST. A Delta-Star exclusive. Once regarded only as a power-transformer test, this is given to each Delta-Star Distribution Transformer, regardless of rating, as an extra assurance of maximum operating life and freedom from the faults that might cause service interruption and early need for repairs.

5 APPLIED-POTENTIAL AND CORONA TEST. Here again, Delta-Star puts its distribution transformers through tests that no other manufacturer uses. The Corona Detector Test shown above employs the most sensitive equipment available to assure absence of rf interference at operating voltages. The applied-potential test is made at the same time.

6 INDUCED-POTENTIAL TEST. Another standard ASA dielectric test, in which a 400-cycle voltage is impressed across full windings. Started at zero, the voltage is brought to full value in less than fifteen seconds. After eighteen seconds, the voltage is returned to zero in less than five seconds.

EXCLUSIVE! EVERY DELTA-STAR TRANSFORMER passes all six of these tests . . . and more

These are regular production-line tests at Delta-Star —not merely spot checks—that help assure the consistent high quality of Delta-Star Distribution Transformers in every EEI-NEMA rating up to 167kva. These rigorous tests are only one important reason why you should investigate the merits of Delta-Star Transformers—to provide your community with maximum uninterrupted service during normal and extraordinary conditions.

FREE CATALOGS. Complete specifications are given in two new Delta-Star Distribution Transformer catalogs. For your copies, write *Dept. 236, Delta-Star Electric Division, H. K. Porter Company, Inc., 17th & Cambria Streets, Philadelphia 32, Pa. District offices in principal cities.*

AND *EXTRA* TESTS FOR EXTRA QUALITY!

Testing of Delta-Star Transformers begins with materials. Destructive and operative tests are carried out regularly on insulations, oil, core steel, wire—every part of every unit. The superior quality of Delta-Star Transformers *rests* on *tests*.

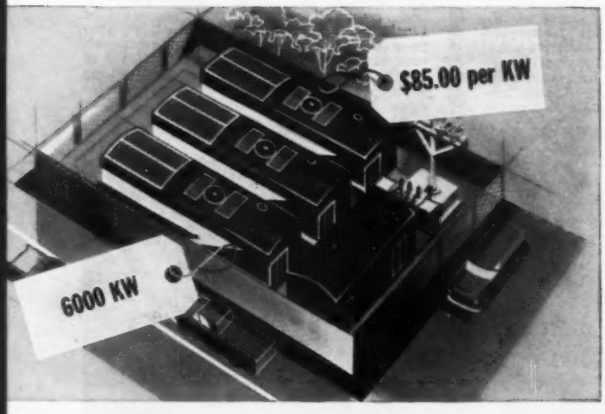
H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

Connors Steel, Delta-Star Electric, Disston, Forge & Fittings, Leschen Wire Rope, Quaker Rubber, Refractories, Riverside-Alloy Metal, Vulcan-Kidd Steel, H. K. Porter Company (Canada) Ltd.

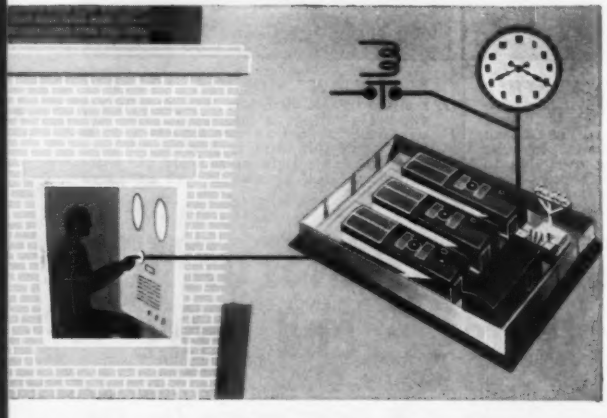
Electro-Motive 6000 KW

Product facts for your peaking plans—



6000 KW at $85.00 per KW*

To perform economically its intended function, peaking equipment must naturally be low in original cost. Electro-Motive equipment meets this cost requirement. *F.O.B. Factory.



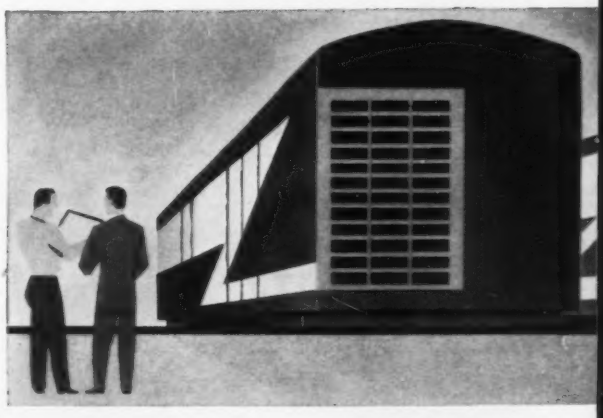
Unattended operation

The 6000 KW Peaking and Reserve Plant operates completely unattended. An electrical impulse is all that is needed—from a time clock, dispatcher, current or voltage sensing equipment or a combination of these methods.

Readily transportable

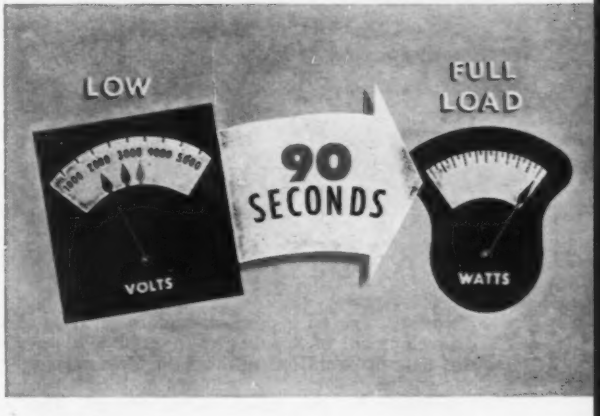
The Electro-Motive Peaking and Reserve Plant is handled much the same way as many transformers. Components are shipped on standard rail cars or highway equipment.

Peaking and Reserve Plant



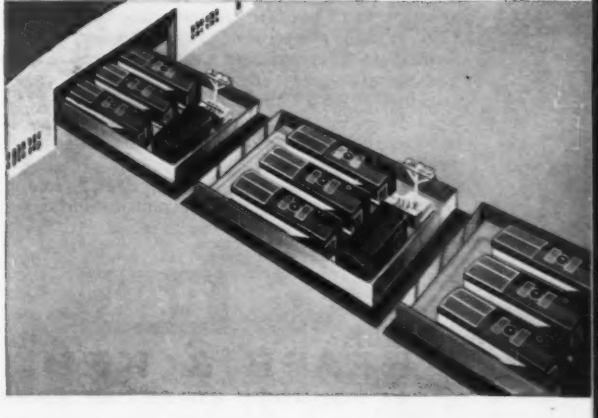
Quiet operation

Silencing arrangements are included to fit the varying conditions under which Electro-Motive Power must operate. Thus considerable freedom can be exercised in location of the equipment.



Quick start

The Electro-Motive Peaking and Reserve Plant starts instantaneously. In a matter of seconds it is on the line at full rating, thus fulfilling the requirement for spinning reserve.



One manufacturer

Electro-Motive Peaking Plants are designed, engineered, manufactured and serviced by Electro-Motive. There is only *one* manufacturing responsibility for the complete plant—starting from fuel input to power output.

ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

LA GRANGE, ILLINOIS **Sales-engineering offices:** Chicago, New York, St. Louis, San Francisco *In Canada:* **General Motors Diesel Limited,** London, Ontario

this 8 page booklet tells you what you want to know
P&K
a universal outdoor lighting fixture
CIRCLElux luminaire
IN THIS CATALOG
more facts about

"PACKAGED" OUTDOOR LIGHTING

Having created a new concept in outdoor lighting with the development of "packaged" units P & K now brings a wealth of new information to the field. Basically, a "packaged" unit is one in which both standard and lighting unit are supplied together by the same manufacturer. The advantages are obvious: simplification of ordering and specifying, reduced shipping and handling costs, ease of assembly and installation. What's most important, however, is the fact that these handsome all-aluminum standards are available in straight and davit styles, in a wide range of sizes, and can be obtained with a choice of three light sources – incandescent, fluorescent or mercury vapor. In this way it is possible to customize any installation with standard units assembled to your specifications.

Now, in this helpful booklet P & K has provided all the facts you want on CIRCLElux units–catalog numbers, lighting curves, electrical characteristics, etc. Write for your copy of LTG-30 today.

P&K

PFAFF & KENDALL

84 FOUNDRY STREET, NEWARK 5, N. J.

Temperature Sensor . . .

(Continued from page 134)

in thickness, it is available in various widths and lengths.

Minco Products, Inc, 740 Washington Ave N, Minneapolis 1, Minn.

Portable Chain Saw . . .

. . . can reach limbs up to 20 ft above ground. This air-operated saw comes equipped with 5-ft, handle and 6-ft quick coupling extensions, all epoxy resin insulated for safety in line clearing use. Known as the Ackley, this unit has high torque motor plus instant starting and vacuum brake for speed and safety at all times. Angle head attachment simplifies difficult or horizontal cutting. Light weight and good balance permit fast work with less operator fatigue.

Equipment & Sales Div, Weed Control Service, Inc, 2650 SW First Ave, Portland, Oregon.

400-W Mercury Lamp . . .

. . . with built-in protective device is designed for street and highway lighting systems operated on straight series circuits. Designed to cope with sudden surges of voltage through the line, this internal "cut-out" eliminates costly maintenance trips to replace external cutout. One lead-in wire of protective device is enclosed in special glass sleeve; second lead-in is wrapped around sleeve. At end of lamp life or under abnormal conditions, internal arc melts sleeve, allowing lead-ins to fuse and complete circuit. Arc is

(Continued on page 141)

DOSSERT UNDERGROUND CONNECTORS...

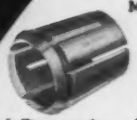
the versatile line

featuring:

- Fully molded, no factory taped joints.
- Insulated with MYPAR* rubber for higher quality and longer life, or MYPRENE* rubber for higher temperature resistance, and greater resistance to acids and oils.
- Made of high conductivity copper, insuring cool operation.
- Interchangeable with all standard underground connectors and their component parts.
- Made to fit standard compression tools.

MICON* type MC

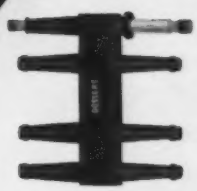
MICON COMPONENTS



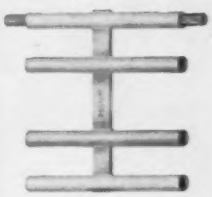
Tapered Compression Sleeve type C

Cable Receptacle type MA

Insulating Sleeve for MICON Outlet type MIS



Insulated Crab Connector type CBR

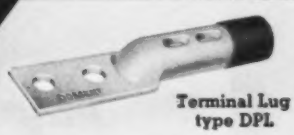


Uninsulated Crab Connector type CBN

MICON Stud Connector type MCBS

Limiter Link Assembly type LLA

Limiter Link Assembly type NLRA



Terminal Lug type DPL

Comp. Coupler type DPC

Comp. Tee Coupler type CRT

*U.S. Reg. Trade Mark

Write for illustrated catalog. →

50 YEARS OF TECHNICAL KNOW-HOW

DOSSERT MFG. CORP.

249 Huron Street, Brooklyn 22, N. Y.

Representatives in all principal cities

moment of tension

REPEATED 600 TIMES AN HOUR

to prove the relentless holding power of

PREFORMED DEAD-ENDS*

Research and Engineering . . . another reason why . . .

You can look up to **Preformed** T. M.

PREFORMED LINE PRODUCTS COMPANY • 5349 St. Clair Avenue, Cleveland 3, Ohio. Cable: Preformed-Cleveland . . . manufacturer of armor rods, dead-ends, Guy-Grip dead-ends and other line accessories.

* Made in accordance with or for use under Patent No. 2,761,273; other patents issued and pending.

400-W Mercury Lamp . . .

(Continued from page 138)

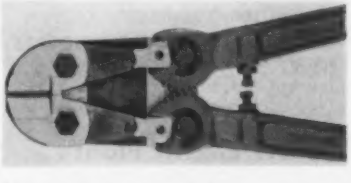
put out before it can damage socket and remaining lamps in series continue to burn. Listed as H1BA, the lamp is intended for 3.2-amp circuits.

General Electric Co, Nela Park, Cleveland 12, Ohio

Illuminated Indicator . . .

. . . measures, indicates, and transmits pressure, draft, differential, and level readings. This two-indicator, Multi-Pointer gage unit is also furnished as a pneumatic receiver. As direct connect gage, each indicator may contain diaphragm element, bellows, or Bourdon tube. Standard ranges are zero-0.5 inch of water to zero-5,000 psig. As an indicating receiver, each unit may contain two pneumatic receiving bellows and can indicate any two variables for pneumatic transmission over ranges of 3-15 or 3-27 psig. Used as an indicating transmitter, one section contains measuring element and second has pneumatic or electric transmitter. Seven-inch scales are available in red, green, blue, yellow, orange and white.

Bailey Meter Co, 1050 Ivanhoe Rd, Cleveland 10, Ohio



Strand and Rod Cutter . . .

. . . cuts high strength steel strand, ground rods, and bolts with one-third less effort, but is simple and reliable. Handles are reshaped for operator comfort. Jaws are shaped to make cut without burring or birdcaging. Tempering assures long life when used on tough materials. Designated as the Hardy HD2CG Hi-Lev cutter, it is available with 20-kv tested PVC-covered handles for use on glove-voltage operations.

Interstate Drop Forge Co, Milwaukee, Wis.

Molding Staples . . .

. . . used with plastic molding for ground wires on utility poles are available in copper-ply or bethanized wire. No. 9 gage wire staples for ½ and ⅝-in. molding have inside lengths of 1.875 and 2 in. respectively. Staples for ¾-in. molding are No. 8 gage, with 2.25-in. inside length. Points of these Hold-Tite staples are bevelled on opposite sides to give legs a spread and increase their holding power. Staple dimensions can be modified to meet special requirements.

E. H. Tichener & Co, 67 Clinton St, Binghamton, N. Y.

Hand Tachometer . . .

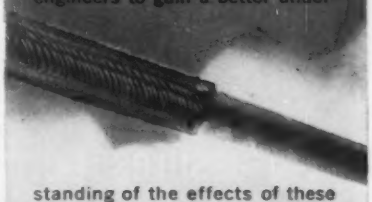
. . . has ± 0.25% accuracy at full-scale deflection. This single-range instrument has 4.7-inch dial diameter and open, easily read scale calibration. The 0.27-inch drive shaft is equipped with ball bearings. Ideal for accurate speed measurement, this instrument is supplied with two large rubber-mounted male and female centers, an extension shaft and center, and oil dropper and container. It comes in 9.5x 6.25x3-inch case. Weight is 3.25 lb.

James G. Biddle Co, 1316 Arch St, Philadelphia 7, Pa.

(More New Equipment, page 142)

No. 2 of a series . . .

One of the most exacting responsibilities in development engineering is that of designing equipment which will closely simulate service conditions in a controlled laboratory environment. In the field of conductor and cable fittings, this poses a particularly complex and important problem. Ordinary down-guys, boom-pendant cables, bridge cables, and other similar installations encounter a rather complex combination of tension, torsion, impact, and vibration. These forces acting simultaneously represent a severe and unpredictable stress configuration which does not lend itself to experimentation using conventional test equipment. The cyclic impact machines at the Preformed Research and Engineering Laboratory were created by PLP engineers to gain a better understanding of the effects of these combined forces on cable fittings of all types.



The equipment incorporates a pivoted beam which is raised and dropped automatically by a system of pneumatic pistons and linkages to obtain desired static and dynamic loads in the attached test specimen. Resultant forces are continuously monitored during the load cycle with multi-gage strain cell instrumentation. Once programed, the machine is regulated to cycle continuously and automatically shut down when major physical changes occur in the test specimen.

This unique equipment makes possible one of many rugged test phases in a continuous program which correlates accelerated laboratory testing with field service experience to provide cable fittings of proven superiority.

Jon Ruhlman

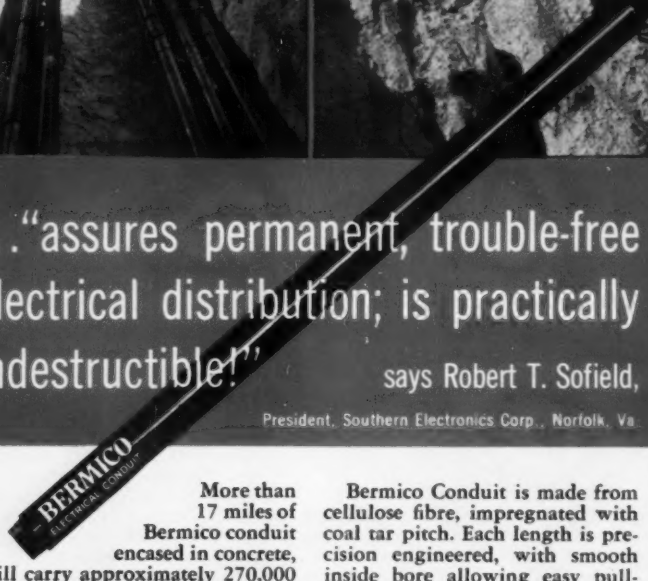
Jon R. Ruhlman, Vice President
Research and Engineering

BERMICO® electrical conduit used at Bomarc Missile Base

...“assures permanent, trouble-free electrical distribution; is practically indestructible!”

says Robert T. Sofield,

President, Southern Electronics Corp., Norfolk, Va.



More than 17 miles of Bermico conduit encased in concrete, will carry approximately 270,000 feet of power and communication lines in the underground electrical distribution system at this new Missile Launching Base at Fort Dix, N. J.

"Because Bermico can be handled so easily it enables a small crew to install it fast," added Mr. Sofield. "On an installed basis, steel would cost about 3 times more."

Bermico Conduit is made from cellulose fibre, impregnated with coal tar pitch. Each length is precision engineered, with smooth inside bore allowing easy pull-through without abrasion. Highly resistant to acids, alkalies, heat, water and corrosion. Widely used by leading contractors on this and other government projects because it surpasses Federal Specification W-C-581 by a generous margin.

Specify Bermico for your next job. Immediate shipment of all sizes and fittings guaranteed.

Distributed by WESTINGHOUSE Electric Supply Company

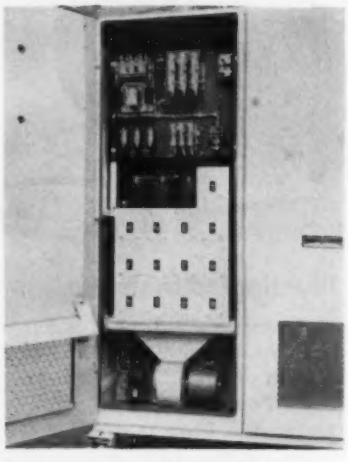
Offices in principal cities

BROWN COMPANY

General Sales Offices: 150 Causeway Street, Boston 14, Mass.
Mills: Berlin, N.H.; Corvallis, Ore.

Ultrasonic Cleaner . . .

. . . removes particles of 2-5 micron size or larger from parts or assemblies. Solution in each of the two 10x14x10 inch stainless steel tanks is continuously circulated and filtered. Each tank has multi-element magnetostrictive 20-kc transducer. Basic unit is offered with single or multiple tanks which fit into 25x25 inch cabinet top.
Blackstone Corp, Jamestown, N. Y.



Packaged D-C Supplies . . .

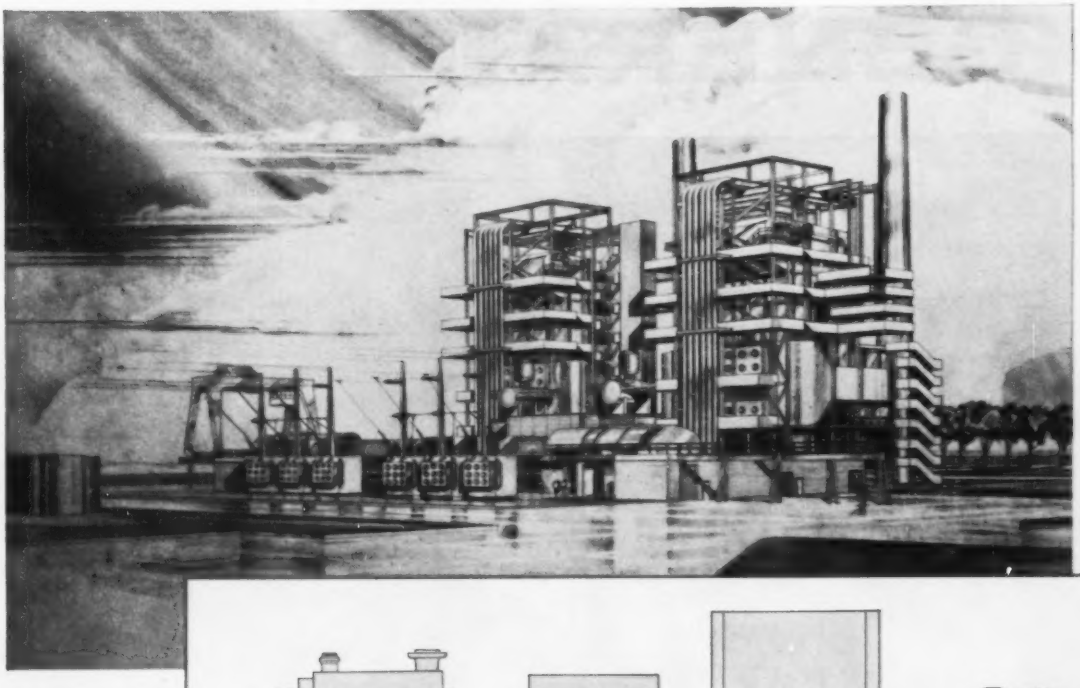
. . . using silicon rectifiers are available in ratings up to 300 kw for motor drives. Rectifiers are housed in small, pull-out drawers to simplify replacement. Breakers indicate faulty circuit in event of failure. Output of the three-phase power amplistats used in this equipment is regulated by transistors. Packaged units permit factory tune-ups and eliminate foundation supports for installation, permitting location on balconies or other out-of-way spots. Ventilation equipment and connections between control and power supply are self-contained. A starter is included as an integral part of the equipment.
General Electric Co, Schenectady 5, N. Y.

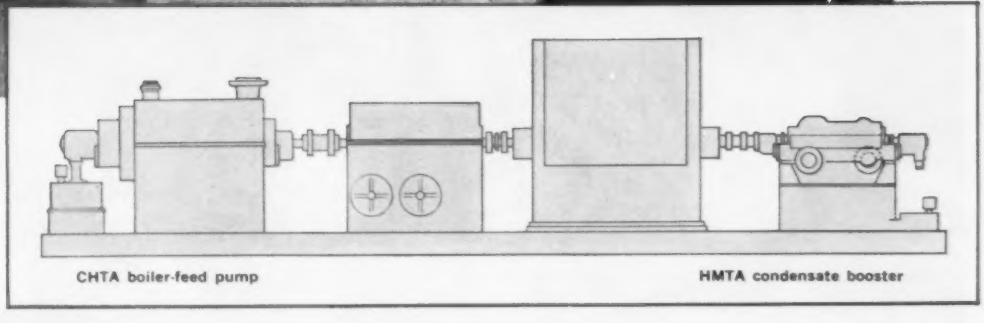
35-KW Electric Plant . . .

. . . for standby power is a 120/208-v unit equipped for remote starting. This model 35R81 is a 12-lead, reconnectable revolving

(Continued on page 146)

For Southern California Edison Company's
new Huntington Beach Steam Station...





CHTA boiler-feed pump

HMTA condensate booster

Ingersoll-Rand pumps will handle all boiler-feed water

WHEN completed, Southern California Edison Company's new Huntington Beach Station will have a name plate capacity of 820 MW of power ... with four cross-compound turbines and oil-and-gas fired boilers. For the first two units now under construction, Southern California Edison (and Bechtel Corp., engineer and constructor) has purchased 10 Ingersoll-Rand pumps to handle all boiler-feed water.

One of the arrangements of boiler-feed pump and condensate-booster pump is shown above. The feed pump at left is an I-R double-case pump rated 2020 gpm at 6400 ft TDH. The booster pump at the opposite end of the driver is an I-R horizontally split unit rated 1850 gpm at 1970 ft TDH.

In addition, I-R is supplying the axial inlet surface condensers for each generator unit... plus the condensate, circulating and heater drain pumps, vacuum pumps and steam-jet ejectors.

When you consider equipment to meet your own power plant requirements, call on your Ingersoll-Rand representative for objective, expert counsel. Let him help you select the *right pump* for each of your applications.

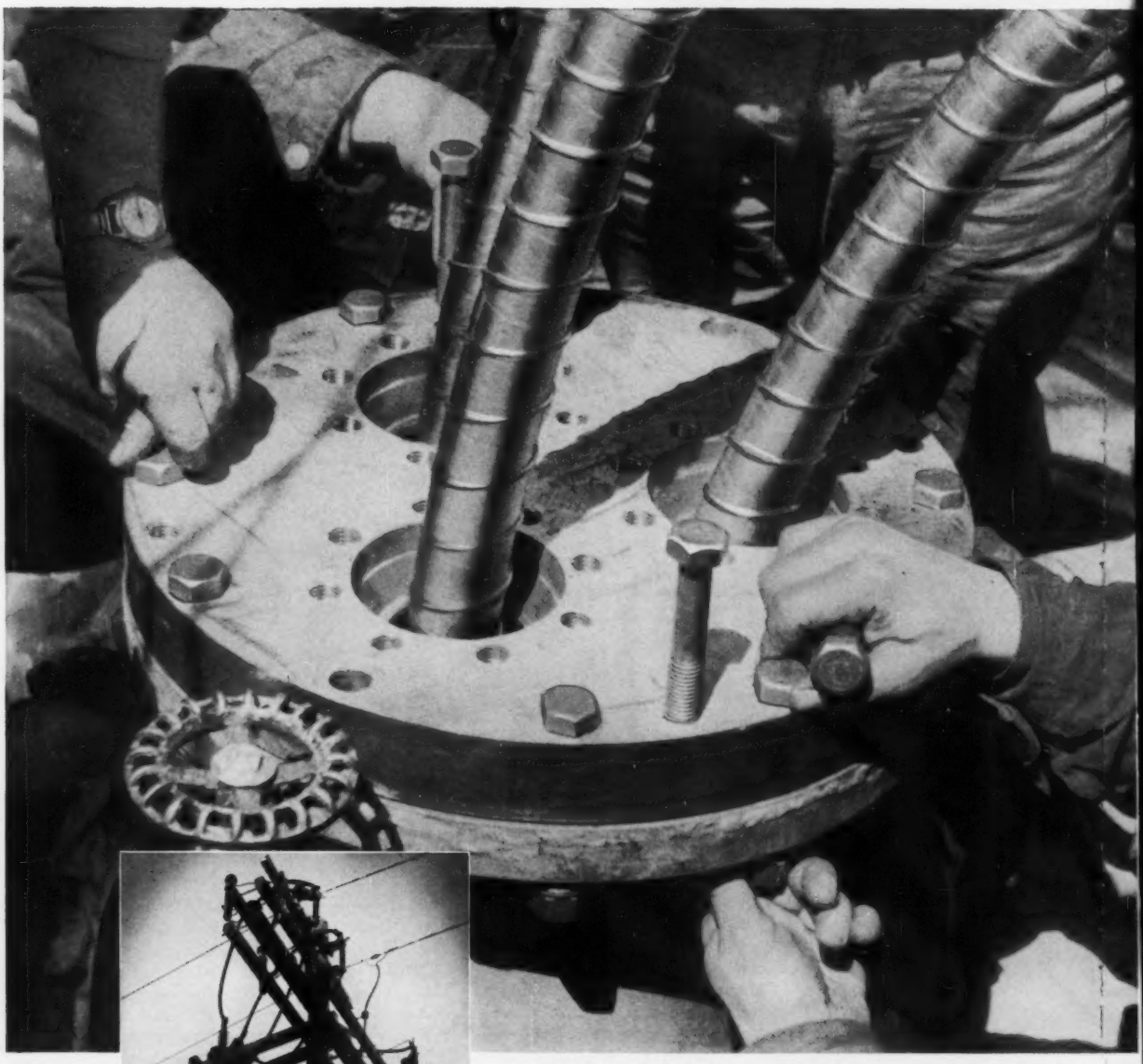
Ingersoll-Rand

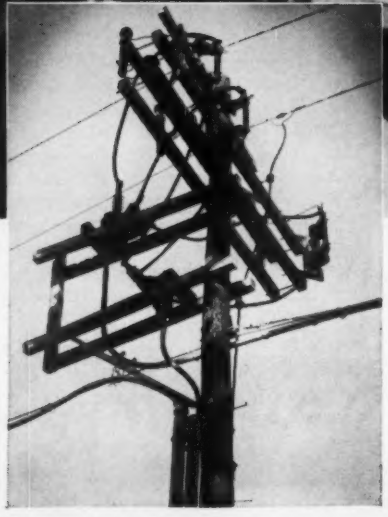
10-875 11 Broadway, New York 4, N. Y.

THERE'S NO SUBSTITUTE FOR EXPERIENCE IN ENGINEERED PRODUCTS

In Paper Insulated Power

GENERAL CABLE





(above and top right) Installation of 1,500 MCM 69 kv High Pressure Oil Filled Cable and Terminal at Philadelphia Electric Company.

(left) Aerial Paper Lead Cable carrying 13,800 volts; installation by Central Illinois Electric and Gas Co., Rockford, Illinois.

Cables...
means PROGRESS

(above) Baltimore Gas & Electric Company installation at large shopping center; direct earth burial cable, 2/0 triplexed 35 kv with neoprene jacket over individual conductors.

FOR OVER 60 YEARS General Cable has pioneered in new constructions and important improvements in paper insulated power cable. Developed in its own Research Laboratories and manufactured in its plants, these constructions have given excellent performance on the job for many years. Today, a leader in the field, General Cable provides a high quality product in every type of paper insulated cable.

CABLES:

- **SOLID**
- **LOW PRESSURE GAS FILLED**
- **LOW PRESSURE OIL FILLED**
- **PIPE TYPE**
  - **High Pressure Gas Filled**
  - **High Pressure Oil Filled**

CONDUCTORS:

- **Copper and Aluminum**
- **Compack Round**
- **Compack Sector**
- **Compack Segmental**
- **Concentric**
- **Hollow Core**
- **Annular Concentric**

GENERAL CABLE CORPORATION
420 Lexington Avenue, New York 17, N.Y.
Offices and Distributing Centers Coast-to-Coast

for quality and service... **specify GENERAL CABLE**

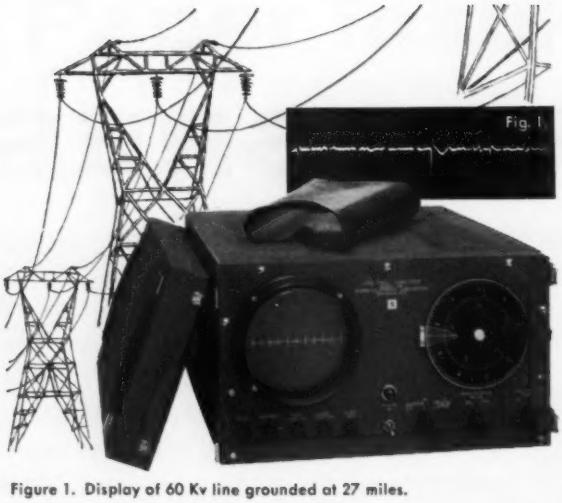


Figure 1. Display of 60 Kv line grounded at 27 miles.

Locate circuit faults exactly ...½ to 200 miles distant

Communication and power lines

Use on any open wire line

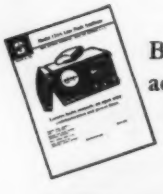
Direct reading, simple to use

Use at carrier terminal, powerhouse, sub-station

Shorts, grounds or opens up to 200 miles away can be located within a few yards with the improved Sierra 124A Line Fault Analyzer. The instrument, operating on radar principles, sends a high amplitude pulse along the line under test. Discontinuities, even capacitors and transformer banks, appear clearly; a complete picture of the line and its condition appears on the radar-type "A" scope.

Two Pulse Widths

To insure maximum readability, two pulses — a 1 microsecond, 1,000 volt pulse or an 8 microsecond, 500 volt pulse —are provided. Other features include a sweep delay, movable distance step, sweep repetition rate of 60 cps and a high intensity flat faced cathode ray tube. Provision is made for camera attachment to the scope face.



Bulletin gives details, actual utility operating experiences

Data subject to change without notice.

Sierra Electronic Corporation

A subsidiary of Philco Corporation

4695W Bohannon Drive • DAvenport 6-2060

Menlo Park, California, U.S.A.

Sales representatives in Major Cities

Canada: Atlas Instrument Corp., Ltd., Toronto, Montreal, Vancouver, Winnipeg

Export: Frazar & Hansen, Ltd., San Francisco, New York, Los Angeles

35-KW Electric Plant . . .

(*Continued from page* 142)

field type with direct-connected exciter and automatic voltage regulation. High torque exciter cranking at high speed assures quick starting. Voltage regulation in within ±2%; frequency regulation, 3 cycles. Offered with gas or gasoline operation, the engine develops 92 hp at 1,800 rpm. Standard equipment includes skid base, vibro dampers, low oil pressure and high water temperature safety devices.

Kohler Co, Kohler, Wis.

450-MC Pre-amplifier . . .

. . . for base station receivers improves effective talk-back range of mobile units associated with two-way systems. It also serves as an antenna matching unit, permitting up to four receivers to be used on one high-gain antenna. Field tests showed improvements of 6 db in many areas. Unit uses new ceramic tube which provides high gain with low noise and has low power drain. This pre-amplifier may also be used in mobile units without extra power supply.

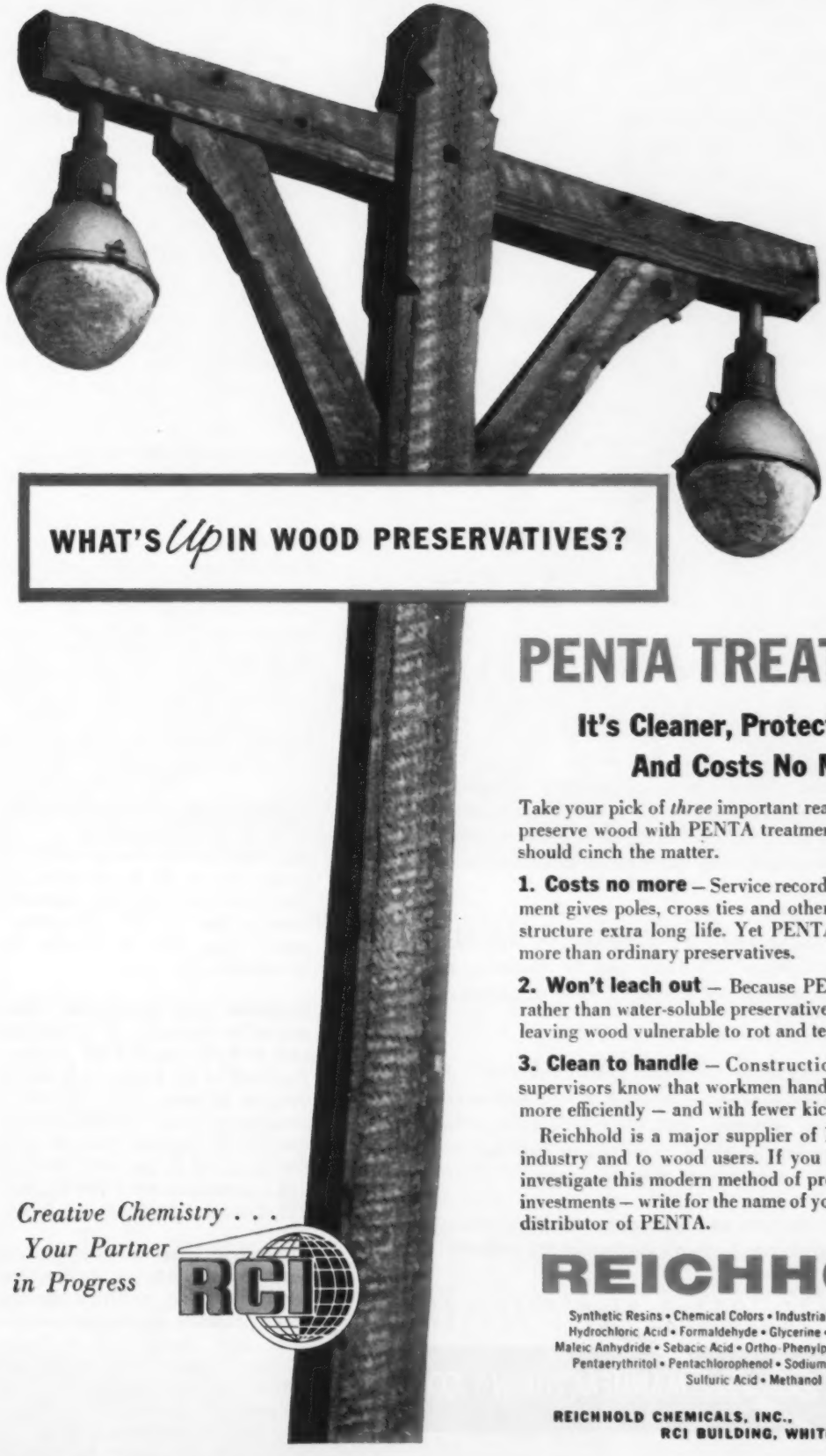
General Electric Communications Products Dept, Section P, Syracuse, N. Y.

More New Products

Portable Wheatstone bridge measures resistors from 0.1 to 1.5 megohms to 0.1% accuracy and up to 10 megohms with 0.25% accuracy. Model 1071 has pointer-light galvanometer, 45-v battery and 5-dial rheostat. When lid is closed, meter is turned off and shorted to dampen suspension movement. — Rubicon Instruments Div, Minneapolis-Honeywell Regulator Co, Ridge Ave and 35th St, Philadelphia 32, Pa.

Aluminum or galvanized steel **cable clamp** for armored cable in ladder racks fits ¾-in. to 8½-in. diam cable and is easily installed. Also used to clip several small cables together.—T. J. Cope Division, Rome Cable Corp, Collegeville, Pa.

(*More New Equipment, page* 148)



PENTA TREATMENT!

It's Cleaner, Protects Better And Costs No More

Take your pick of *three* important reasons why you should preserve wood with PENTA treatment! Any *one* of them should cinch the matter.

1. Costs no more – Service records show PENTA treatment gives poles, cross ties and other lumber for exposed structure extra long life. Yet PENTA treatment costs no more than ordinary preservatives.

2. Won't leach out – Because PENTA is an oil-borne rather than water-soluble preservative, it doesn't leach out, leaving wood vulnerable to rot and termites.

3. Clean to handle – Construction and maintenance supervisors know that workmen handle clean wood faster, more efficiently – and with fewer kicks!

Reichhold is a major supplier of PENTA to the wood industry and to wood users. If you haven't done so yet, investigate this modern method of protecting your lumber investments – write for the name of your nearest Reichhold distributor of PENTA.

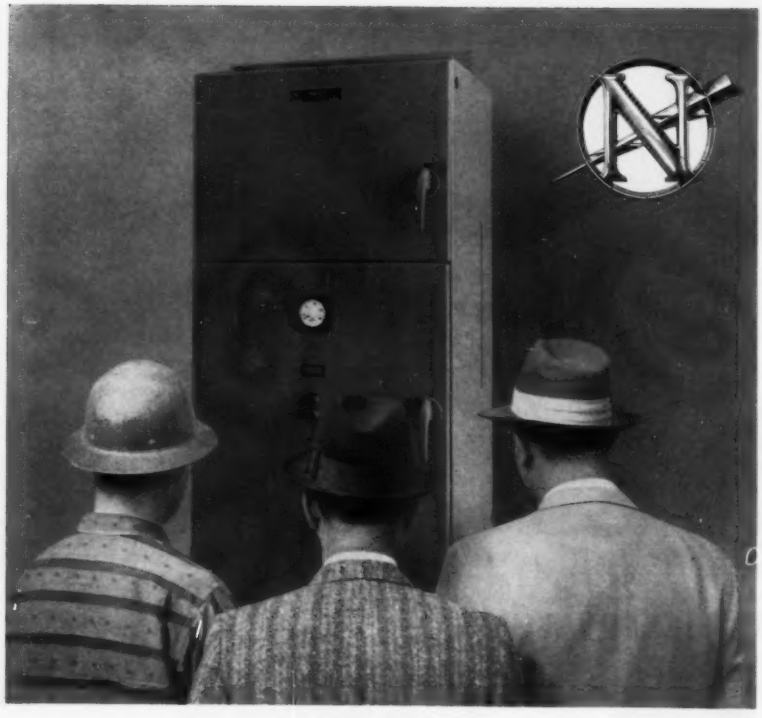
Creative Chemistry . . .
Your Partner in Progress

RCI

REICHHOLD

Synthetic Resins • Chemical Colors • Industrial Adhesives • Phenol
Hydrochloric Acid • Formaldehyde • Glycerine • Phthalic Anhydride
Maleic Anhydride • Sebacic Acid • Ortho-Phenylphenol • Sodium Sulfite
Pentaerythritol • Pentachlorophenol • Sodium Pentachlorophenol
Sulfuric Acid • Methanol

REICHHOLD CHEMICALS, INC.,
RCI BUILDING, WHITE PLAINS, N. Y.



The fascinating story of the three hats

"I'm a field man. My job includes installing and maintaining our electrical equipment. That's the reason I like Nelson. You don't have to be an M.I.T. grad to figure out how to install their stuff. Their design makes my work easier when routine maintenance is necessary."

"I'm an electrical engineer. I like Nelson, too. The equipment I specify must operate efficiently and be perfectly reliable. Trouble-free components are a must. I have no doubts when I specify Nelson."

"I'm a purchasing agent. I buy only quality equipment. Prompt action on my purchase orders is essential to me. Nelson acknowledges my orders promptly, and their production scheduling assures me of on-time delivery. Nation-wide field service leaves no doubt that they take care of their customers."

May we suggest that you, too, learn more about Nelson and their complete line of electrical control equipment for industry.

a major source of electrical control equipment for industry

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

Metal pipe **outdoor lighting base** provides full thread engagement for ordinary pipe or conduit within the base to seal out moisture and prevent corrosion. Four sizes with either a plain junction chamber cover, or a weatherproof 3-pole receptacle.—Hope Electrical Products Co, 39 Long Ave, Hillside, N. J.

Clutch-brake **motor** has a constantly rotating high inertia rotor to provide stored energy for smooth, fast starts under suddenly applied loads in metal working and automatic production machinery. Double-acting solenoid or air or hydraulic cylinder operated lever actuates clutch-brake assembly. Standard motors range from ½ to 5 hp.—Ferguson Machine Corp of Indiana, 7818 Maplewood Industrial Court, St. Louis 17, Mo.

High-precision, 48-amplifier, **analog computer** has building-block design and is packaged for easier maintenance. Functions and accessories may be added to the MC-5800 Precision Master Analog Computer in the field. Metal enclosure is 4 ft x 2 ft x 6½ ft.—Mid-Century Instrumatic Corp, 611 Broadway, New York, N. Y.

Model 1500 **dehumidifier,** for moisture control in warehouses and larger commercial storage areas, can remove up to 40 lb of water per hour and will maintain humidity levels as low as 10% r.h.—Dryomatic Corp, 806 N. Fairfax St, Alexandria, Va.

Electronic dust precipitator operates at face velocities up to 600 fpm and is 50% smaller by volume. Each cell of the Electro-cell has its own set of vertical ionizing wires, eliminating a separate ionizer section. Cell capacity ranges from 800 to 2,750 ft per min. Bulletin 258.—American Air Filter Co, Inc, 215 Central Ave, Louisville 8, Ky.

Fluormeric **lamp** can be used in outdoor or indoor applications, screws into an ordinary electric socket, requires no auxiliary equipment and attains full brilliance quickly. Manufactured in 450 and 750 w, will burn 6,000 to 12,000 hr, yields 30 lumens per w.—Duro-Test Corp. North Bergen, N. J.

• Southwire Galvanized Steel Strand

STRAND SIZE	5/8"	1/2"	7/16"	3/8"	5/16"	9/32"	1/4"	3/16"
WEIGHT PER 1000'	813 lb.	517 lb.	399 lb.	273 lb.	205 lb.	164 lb.	121 lb.	72.9 lb.
MINIMUM BREAKING STRENGTH IN POUNDS								
ASTM A-122-54T								
Galvanized (Single Galv.) Common	11600	7400	5700	4250	3200		1900	1150
Class A (Double Galv.) Common	11600	7400	5700	4250	3200		1900	1150
Class A (Double Galv.) Siemens-Martin	19100	12100	9350	6950	5350	4250	3150	1900
Class A (Double Galv.) High Strength	29600	18800	14500	10800	8000	6400	4750	2850
Class A (Double Galv.) Extra High-Strength		26900	20800	15400	11200	8950	6650	3990
Class A Utilities Grade, A.T.&T. and Western Union Spec.—7-wires		25000	18000	11500	6000*	4600		2400**
ASTM A-363-55T (No welds)								
Weldless High-Strength		18800	14500	10800	8000			
Weldless Extra High Strength		26900	20800	15400	11200			

*weight per 1000'—225 lbs. **weight per 1000'—80.3 lbs.

The infinite patience and skill used by the seafarer in stranding or splicing rope is matched by modern machines at Southwire.

Southwire Galvanized Steel Strand is manufactured to meet or exceed applicable ASTM specifications . . . and preformed to eliminate flared ends when sheared. Quality is our first concern, including premium-quality non-returnable reels on all reel shipments. Available in 250', *500' and 1,000' coils, 2,500', *5,000', 5,280' reels. Feel free to inquire about special packaging to suit your particular requirements.

Specify Southwire Galvanized Steel Strand for ground, messenger and guying applications, *shipped by our own fast fleet of trucks direct to your warehouse or jobsite.*

*Stock items

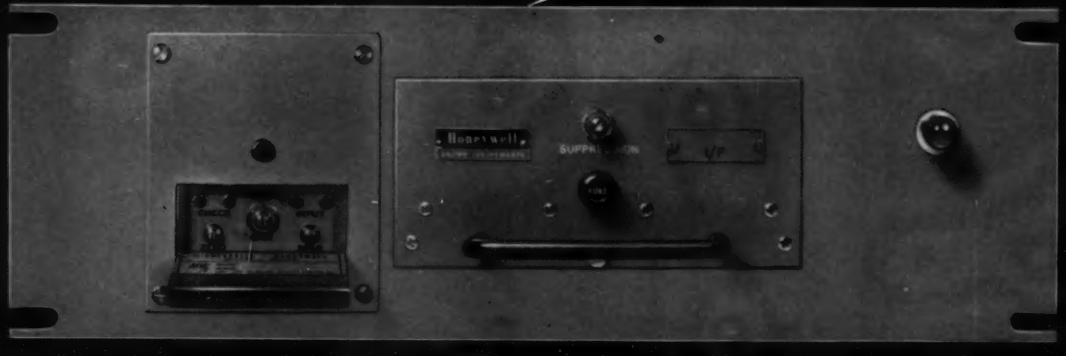
Southwire Company

Carrollton, Georgia—TErrace 2-6311

- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene, Polyethylene, and VWP (Vinyl) Weatherproof Copper, Aluminum and Triplex
- U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Galvanized Steel Guy Strand and Static Wire
- Aluminized Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories
- NM Sheathed Cable

• ALSO FABRICATORS OF COPPER AND ALUMINUM FOR WIRE AND CABLE MANUFACTURERS

NEW **Tubeless**



Honeywell frequency-type tubeless telemetering transmitter. The millivolt-to-current transducer on the left converts the mv signal of the sensing element to current. The current-to-frequency transducer converts the current to a transmittable frequency that is a measure of the original variable.

Withstands extremes of ambient conditions without loss of its high accuracy

Use this new system for telemetering load, control intelligence, or any variable that can be transduced to an electrical signal. It incorporates solid state components—transistors and magnetic devices—for highest long-term reliability.

Designed to meet all central station requirements, it's suitable for all types of telemeter channels, including lowest-cost leased lines.

Your nearby Honeywell field engineer can give you complete details. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Aves., Phila. 44, Pa.

● **REFERENCE DATA: Specification S-301-1**

Telemetering System

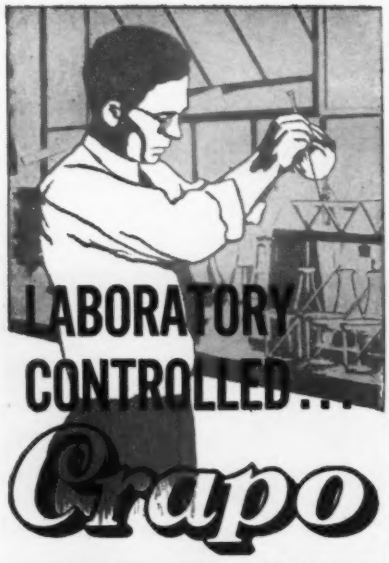
Two frequency-to-current and/or millivolt receiver units mount side by side in standard 19" wide relay racks. Signal is converted in this unit for recording and/or controlling purposes.

Some of the features of Honeywell's telemetering system:

- Accuracy: ± ¾% from 30 to 120°F. ambient temperature.
- Linearity: within 0.1%.
- Speed of response: One second for 95% of scale.
- Wide frequency band (5 to 15 cps or 6 to 30 cps) provides improved resolution.
- Standard 19" relay rack mountings; space-saving, drawer-type construction.
- Modular plug-in construction.
- Field tested for over two years.

Honeywell

First in Control



GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.

Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana

Utilities Back FBE Program

Farmers are told benefits of electricity via promotional support from power companies, colleges and manufacturers

The Farm Better Electrically Program was formed in 1957 to tell the American farmer what the rest of the country was already being told —how to live better electrically.

Educational institutions, farm agents, farm magazines, electric power suppliers, electric equipment manufacturers, dealers and wiring contractors all bonded together to make the farmer more aware of electricity's benefits.

The power companies especially got solidly behind this drive. Here's what some of them are doing . . .

New York State Electric & Gas Corp is holding Farm Better Electrically Days at dealer stores. The company helps the local dealer by advertising and promoting the Day. A Farm Service and a Home Service representative demonstrate farm and home electrical equipment. Door prizes and special buys are offered. Farm Better Electrically banners and displays decorate the store. One dealer has reported sales of four 80-gal electric water heaters, three barn ventilation fans, one air compressor, two bulk milk coolers, three automatic washers, two electric ranges and one clothes dryer.

Niagara Mohawk Power Co has held a series of Farm Better Electrically meetings for farm equipment dealers. The program was explained and assistance of the company's rural representatives offered. One representative reported he was called out by dealers on six barn and one poultry ventilation job.

Ohio Power Co has a program for installation of automatic protective farm and home outdoor lighting. The company installs 2,500 lumen

(*Continued on page* 154)

Photo-electric Cell Helps Sell Dryers

A photo-electric cell is attracting passersby to electric clothes dryer window displays in several divisions of The Kansas Power & Light Co. The company is using a cooperative system with department stores and others. As shown in the picture above, the passerby places his hand over the "electric eye" to start the dryer. The photo-electric cells are the same type as used in KP&L's street lighting systems.

Revere Urban-Lites provide economical lighting for secondary streets. Splice box in neck makes wiring easy, U-bolt and leveling screws permit accurate, permanent positioning.

REVERE PLANNED STREET LIGHTING

Revere Urban-Lite makes efficient use of 100, 175, or 250-watt mercury lamps for uniform light where lower intensity light is adequate.

The Revere Urban-Lite was especially designed to solve a specific problem — to provide lightly-traveled residential streets with uniform lighting at lowest possible cost. It is smart in appearance, and uses horizontal burning mercury or incandescent lamps for economy and efficiency where high intensity lighting is not required. It is also available wired for plug-in type individual photo-electric control.

Other street lighting problems call for different types of equipment. For every problem, Revere offers high quality lighting fixtures that are specifically designed to provide the most efficient, economical solution. Write for a Revere Street Lighting Catalog.

Other luminaires from Revere's complete line

For heavily-traveled streets —Revere Endoval luminaire uses 11,000 or 21,000 lumen mercury lamps for high-intensity illumination. Reversible slip-fitter for mounting horizontally or with 10° tilt.

For moderately-traveled streets —Revere Star-Lux luminaire uses up to 10,000 lumen incandescent lamps, or 250 to 400-watt mercury lamps to meet varied needs.

Revere ELECTRIC MFG. CO.

OUTDOOR LIGHTING

Revere Electric Mfg. Co. • 7420 Lehigh Ave. • Chicago 48, Ill.

Available in Canada thru Curtis Lighting, Ltd., Leaside, Toronto, Ontario

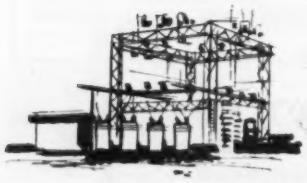
STEEL or ALUMINUM

You specify it...

schuler *fabricates substations of both*

For sound, competent and unbiased counsel on which metal you should use, you can rely on SCHULER. In addition to being a major supplier of galvanized steel substations and towers, Schuler has designed and fabricated aluminum structures for several years. The Schuler Engineering Department conducts cooperative research with major producers of both metals. Schuler's long experience in working to the highest utility standards, and integrated fabricating and galvanizing facilities are your guarantee of quality workmanship. Your inquiry is invited, and we will be pleased to forward our brochures.

If you prefer packaged substations, tell your switchgear supplier to specify Schuler—we work with all leading manufacturers.



schuler
ENGINEERING COMPANY
109 Cambria St. - Newark, Ohio

F B E Program

(*Continued from page* 152)

(189 w) lamps mounted in a glass diffusion bowl and controlled by a photoelectric relay for individual farms and suburban residential customers located outside of incorporated municipalities. This includes Grange Halls, schools, churches, etc. The lamp automatically turns on at dusk and off at daybreak, offering the customer all-night lighting.

Consumers Power Co offers a brochure, "Milkhouse Heating Ends Winter Milkhouse Misery" featuring the FBE symbol, and a large banner proclaiming, "Do milkhouse chores in comfort with an electric milkhouse heater."

Texas Power & Light Co offers booklets to dealers on selling many types of electrical equipment, and display kits to be used in pushing these sales.

The Ohio Electric Power Companies, in cooperation with *The Ohio Farmer*, held a letter-writing contest for Ohio farmers. Prize-winning letters reporting the best and most profitable ways of using electricity were reprinted in the magazine.

How many other companies have gotten behind this program? Harold H. Beaty, coordinator of the program at Edison Electric Institute, reports these results: Seventy companies have bought Farm Better Electrically promotional material. Several others are using the symbol in their own promotional programs. Over 125 power suppliers have rallied behind the program. Twenty farm production equipment manufacturers have ordered materials; others are using the symbol in their advertising. Colleges, too, are using the FBE seals and banners. In all, 348,000 pieces of promotional material have been sold.

Commercial Heat Up 70%

The first six months of 1958 have shown a 70% increase in commercial electric heat installations over the same period last year for the Washington Water Power Co. Gordon DeFoe, general sales supervisor, also reports an 11.6% increase for residential primary electric heat installations.

INTERLOCKED ARMORED CABLE

For Power Distribution in New Plants or in Modernizing Old Plants For more current capacity than cable in conduit or other armored cable, *specify and buy Rockbestos A.V.C.* . . . for easy installation on racks or hangers beneath the ceiling or next to walls, *specify and buy Rockbestos A.V.C.* . . . To eliminate costly conduits and ducts . . . to save important dollars on materials and installation time, to permit quick, easy repairs, *specify and buy Rockbestos A.V.C.* . . . All interlocked armored cables are not alike . . . and, for maximum dollar-savings and maximum performance be sure to *specify and buy Rockbestos A.V.C.* Interlocked Armored Cable — the superior AVA Cable.

Write now for the new Rockbestos manual which gives the application and design data to help you *specify and buy Rockbestos A.V.C.*

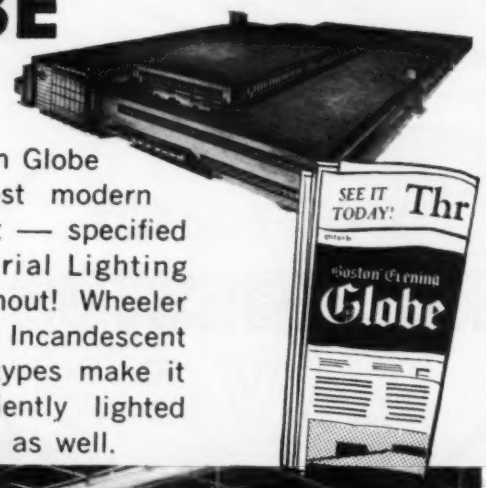
ROCKBESTOS PRODUCTS CORPORATION, NEW HAVEN 4, CONNECTICUT

NEW YORK • CLEVELAND • DETROIT • CHICAGO • OAKLAND • PITTSBURGH
ST. LOUIS • LOS ANGELES • SEATTLE • ATLANTA • DALLAS

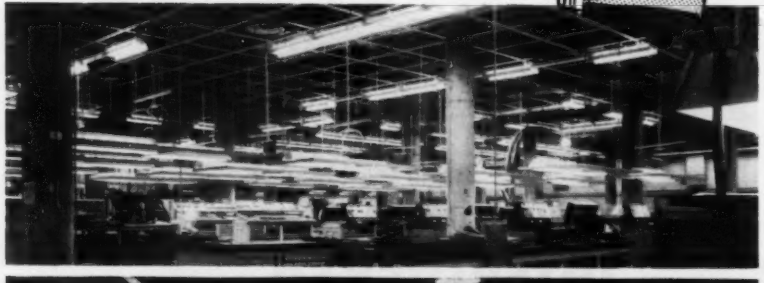
ROCKBESTOS A.V.C.

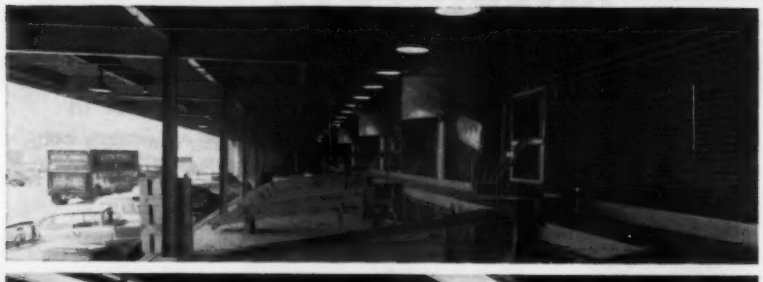
THE SUPERIOR A.V.A. CABLE

Wheeler LIGHTS THE GLOBE



Ultra-new Boston Globe — world's most modern newspaper plant — specified Wheeler Industrial Lighting Fixtures throughout! Wheeler Fluorescent and Incandescent Fixtures of all types make it the most efficiently lighted newspaper plant as well.





Take your industrial lighting problem to . . .

Wheeler REFLECTOR COMPANY

Division of Franklin Research Corporation

275 Congress Street, Boston 10, Massachusetts

USBR Approves Contract on Sale to Utah P&L

The Bureau of Reclamation has approved a short-term contract for the sale to Utah Power & Light Co of non-firm energy from power plants of the Weber Basin Project in north-central Utah.

The one-year contract provides for sale to the company of approximately 20 million kwhr of summer non-firm energy and about 7 million kwhr of winter non-firm energy. Rate is 3 mills a kwhr for summer and 4-1/2 mills for winter.

The non-firm energy will be available from the recently-completed Wanship and nearly-completed Gateway power plants. Wanship, with 1,400 kw of installed capacity, and Gateway, with 4,000 kw, are designed to provide power for irrigation pumping. The Bureau of Reclamation will use the UP&L system to transmit power to project pumping plants.

Until the project is fully developed, fairly large amounts of non-firm energy will be available. When the project is completed, in about 20 years, there will still be roughly 4 million kwhr of non-firm energy available in winter and about 4.7 million kwhr in summer.

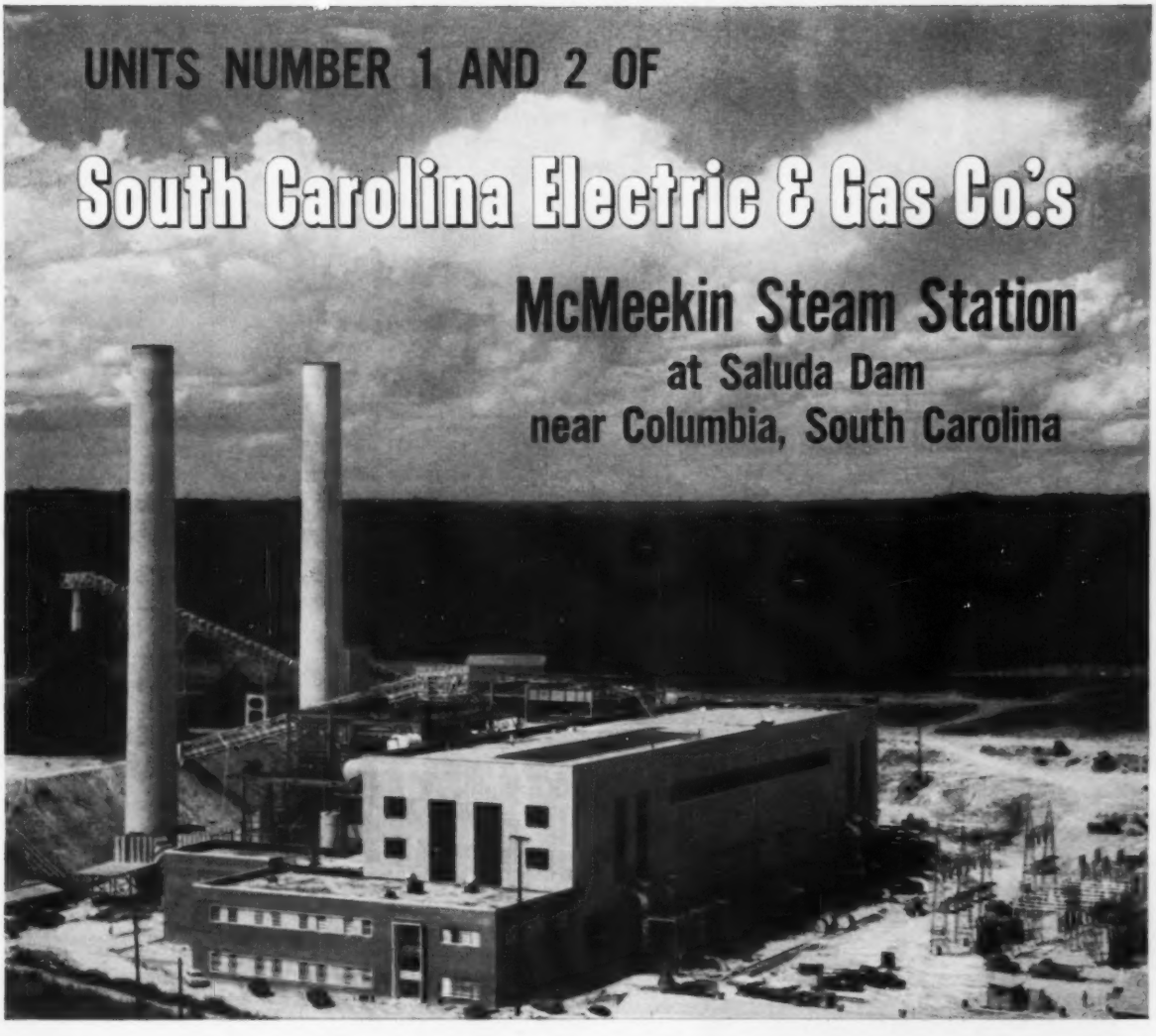
Sale of non-firm project energy to the Utah Power & Light Co under a one-year contract will mean about $90,000 in revenue to the government. At the same time, the short-term contract makes possible negotiations with preference customers should they desire the non-firm energy. A preference customer would have to build a line to the power plants to obtain the power or arrange wheeling contracts with the UP&L. The municipality of Bountiful is the only preference customer indicating an interest so far.

PLAN '59

HOW MANY . . .

. . . new steam power plants have been placed in operation by all U. S. utilities in the last 20 years?

See the October 13 issue of Electrical World


UNITS NUMBER 1 AND 2 OF
South Carolina Electric & Gas Co.'s
McMeekin Steam Station
at Saluda Dam
near Columbia, South Carolina

Silas C. McMeekin steam electric generating station, strategically located at the foot of Saluda dam and adjacent to the hydro plant, incorporates two outstanding innovations in power plant design. Circulating water is taken from and returned to the existing penstocks of the hydro plant utilizing the lake water with year round temperatures averaging approximately 52° F. The steam generators are of a new "low head" design with an overall height of 90 feet.

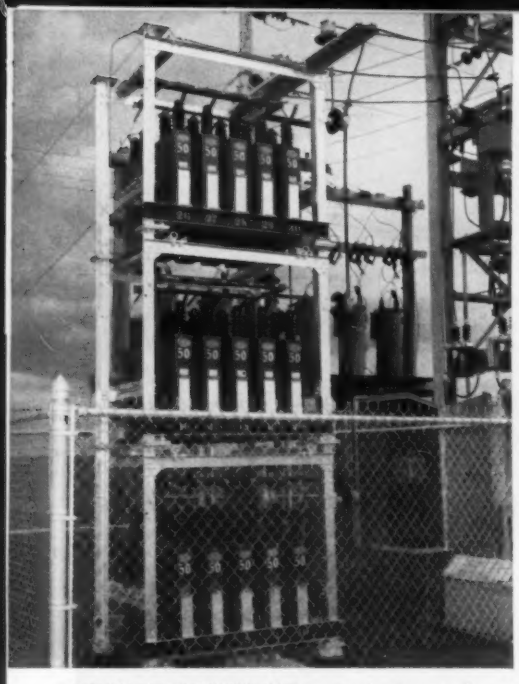
The station consists of two cross-compound, axial flow turbine generators each rated at 137,500 kilowatts capability operating at 2400 psig with 1050° F. initial and 1000° F. reheat temperatures. Each of the controlled circulation steam generators, fired with pulverized bituminous coal, has a rating of 910,000 lbs. per hour.

Unit No. 1 is now operating and Unit No. 2 is scheduled for commercial operation later this year.

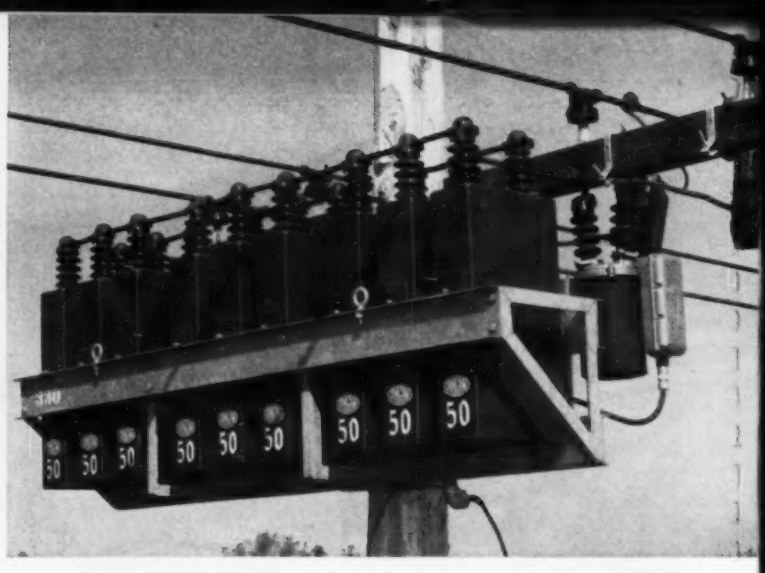
Gilbert Associates, Inc. is proud to have participated in the development of this new station of advanced design.

A SYMBOL OF GAI FOUNDED 1906 PROGRESS

GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS
READING, PENNSYLVANIA



OPEN-TYPE EQUIPMENTS... Singlephase stacking units can be arranged in combination to give any desired bank kvar at subtransmission and transmission voltages. Three phase open-type racks are available for small bank installations at substations.



AUTOVAR EQUIPMENTS... These factory-assembled, pre-wired pole-type equipments permit fast, easy, and low cost capacitor installation on distribution circuits—available in multi-row, in-line, cluster mount, or designs to user specications.

SANGAMO can fill all the *MOST COMPLETE*

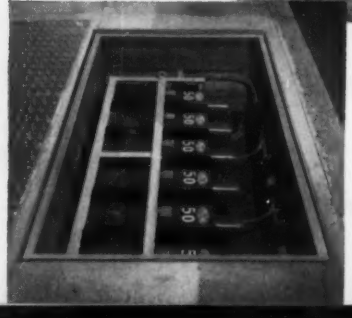
Whether you install power factor improvement capacitors in banked high voltage units or as individual low voltage units, you can make Sangamo your primary source of supply for all your capacitor needs.

Sangamo offers the most extensive line of primary and secondary capacitors, equipments, and controls available from any manufacturer.

For more information ask your Sangamo Representative or write for Bulletins 1110, 1130 and 1131.

INDIVIDUAL UNITS... Sangamo 15, 25 and 50 kvar primary power capacitors are built to utility engineers' specifications to assure "performance stability." They are stocked in all NEMA voltage ratings, and special ratings can be readily supplied.

HOUSED CAPACITOR EQUIPMENTS... Engineered for safety and appearance, Sangamo housed capacitor equipments provide a compact installation. They can be supplied with automatic control, and with or without circuit breakers.



UNDERGROUND EQUIPMENTS...These enclosed submersible primary capacitors provide kvars in locations where overhead pole space is not available. Capacitor units are completely sealed to guard against mosture or submersion in underground vaults.

Type S Plug-in 2 kvar unit, for meter socket mounting.

Type N Nipple connected 3 kvar unit, for three phase service.

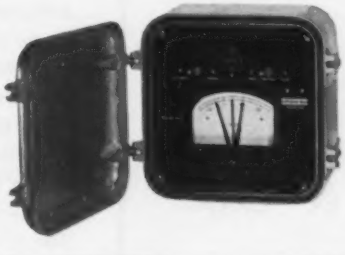
Type N Nipple connected 1 kvar unit, for adjacent mounting.

SECOVAR SECONDARY CAPACITORS... Only Sangamo can offer these 240 volt capacitors for installation at the customer's service to give maximum system benefits all down the line. They give the advantages of low first cost—quick and easy installation—installation off the pole. Secovar capacitors are available in three types with optional thermostatic switch for automatic operation.

your capacitor needs from *LINE IN THE INDUSTRY*

SECONDARY CAPACITORS... Pole-type secondary capacitors for mounting directly to pole or cross arm. Indicating type fuses are available.

SUBMERSIBLE SECONDARY CAPACITORS... These secondary capacitors are completely sealed against moisture. Ideal for low voltage underground network installations. Available in factory-assembled equipments to fit your needs.



Sangamo also offers the most complete line of automatic controls for your capacitor installations. Whether you wish to switch capacitors as a function of voltage, current, watts, vars, temperature, time—or combinations of these—Sangamo can supply a control for your application. No other manufacturer offers this variety.

PC58-5

LIVE BETTER ELECTRICALLY

SANGAMO Electric Company

SPRINGFIELD, ILLINOIS

Will Your Customers

Need More Power

in 1959?

The growing list of new household uses for electricity means better living conditions for America's rapidly expanding population. In the last year and a half, to help meet this need for more power, Kidder, Peabody & Co. and Kidder, Peabody & Co., Incorporated took an active part in the underwriting and sale of 155 new utility issues amounting to more than $3,200,000,000.

Through Kidder, Peabody's 23 offices from coast-to-coast we have the extensive contacts and facilities to achieve the prompt, economical distribution of new issues. You are cordially invited to call on us at any time for detailed information on how your corporation can meet its requirements for additional capital in 1959.

A partial listing of power companies whose issues were managed, co-managed or placed privately by Kidder, Peabody & Co. and Kidder, Peabody & Co., Incorporated appears at the right.

KIDDER, PEABODY & CO.

FOUNDED 1865

Members New York and American Stock Exchanges
Members Boston and Midwest Stock Exchanges

17 WALL STREET • NEW YORK 5, N. Y.

BOSTON PHILADELPHIA CHICAGO LOS ANGELES

California Electric Power Company
Carolina Telephone & Telegraph Company
Central Hudson Gas & Electric Corporation
Central Louisiana Electric Company, Inc.
Eastern Utilities Associates
Florida Power Corporation
Florida Power & Light Company
Florida Telephone Corporation
Hawaiian Telephone Company
Idaho Power Company
Interstate Power Company
Middle South Utilities, Inc.
Missouri Public Service Company
New England Electric System
Pacific Power & Light Company
Potomac Electric Power Company
Public Service Company of New Hampshire
Rochester Gas and Electric Corporation
South Carolina Electric & Gas Company
United Utilities, Incorporated
Upper Peninsula Power Company
Utah Power & Light Company
The Washington Water Power Company

The Management Newsletter

Report on
Electrical Business Outlook

I. Are Inflation Fears Justified?

Inflation is again occupying the center of the stage as the business recovery gets underway. Before the red ink is dry on recession-struck companies' books, the U. S. has caught a monumental case of inflation jitters.

This fear of continually rising prices is a normal one—pushed to abnormal proportions by events this summer. First, we face prospects of a $12 billion federal deficit this fiscal year—the biggest ever in peacetime—and, with government spending on the rise, it looks as if we must accept deficits in the range of $5-10 billion over the next three years. Second is the fact that consumer prices rose steadily during the recession. Third, there is international tension, which generally puts an ebullient note into the commodity markets.

The big question is: Does this mean big inflation? Are we in for a repeat performance of the price rises of the last 20 years, which dragged the pre-war dollar down to its present value of 48¢?

The answer is no, for three good reasons:

1. A large reserve of manufacturing capacity, which means there will be no shortage of goods for some time to come.

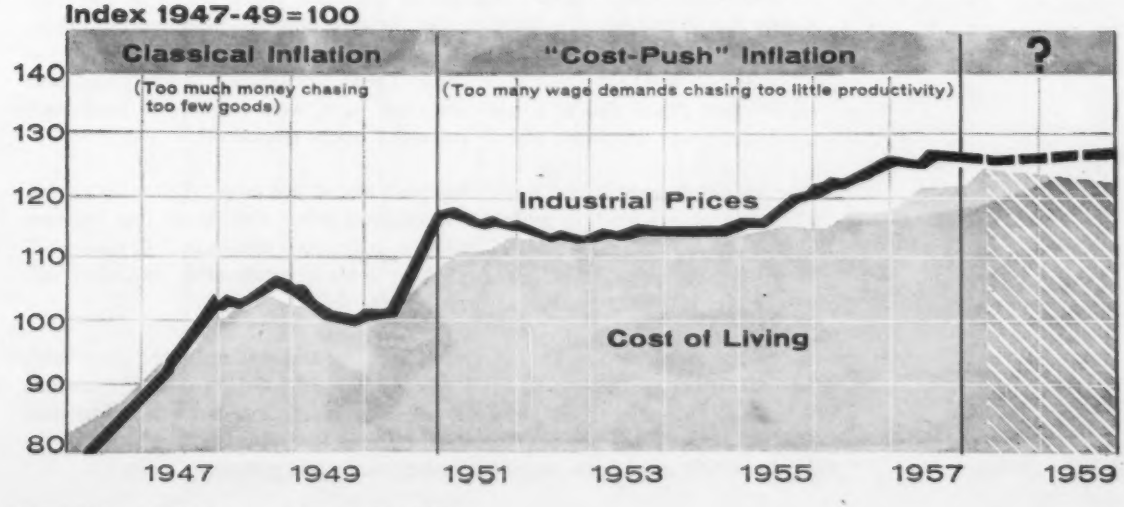
2. A more than ample labor supply.

3. The determination of the Federal Reserve authorities to tighten up on credit quicker and more decisively than they did in the 1954 upturn.

Take a look at the post-war period. Since the end of World War II, the U. S. has been buffeted by two surges of inflation in the classical sense of "too much

Post-War Inflation . . .

. . . has come in two different varieties, and
we may now be witnessing the development of a third



money chasing too few goods." Combined, these two waves of inflation accounted for more than 75% of the total increase in price level since 1945.

When World War II ended, four years of pent-up consumer demand hit the economy all at once. This demand was reinforced by a credit surplus created by more than $150 billion of wartime federal deficits which the Federal Reserve (owing to a commitment to help the Treasury with its financing) was powerless to control. Factories, retooling from war production, simply could not turn out consumer goods fast enough. By 1948, consumers had bid up prices by about 30%.

At the beginning of the Korean War, the sudden demand for war production was reinforced by a rush of "scare buying" by consumers whose memories of rationing were still fresh. The Federal Reserve Board could still do nothing to tighten credit. Again the demand outstripped manufacturing capacity to produce goods. Consumer and wholesale prices went up about 10% in 18 months.

Contrast that with the present situation. The Federal Reserve Board, having been freed in 1951 from their duty to buy Treasury bonds at par, are now committed to a gradual tightening of credit as we move out of the recession. They have raised the rediscount rate, forcing banks to up their 'prime' rate of interest from 3½% to 4%. They have raised the margin for stocks from 50% to 70%. They have declined to bail out the bond market by purchasing long-term Treasury bonds indefinitely.

At the same time, the ample state of manufacturing capacity insures that there is not going to be any shortage of goods, leading to rampant inflation of the "too much money chasing too few goods" variety, for some time to come. With all this slack in the economy, a boom in demand will pull up production instead of prices.

II. What About 'Creeping' Inflation?

Since 1951 most of our inflation has been of the "cost-push" variety, which might be described as "too many wage demands chasing too little productivity." The effect of this on manufacturers has been to make it extremely difficult to accommodate higher wages without raising prices. Since 1956, the "cost-push" has been largely responsible for price increases averaging between 2% and 3% per year, and this rate held up throughout the recession.

We will still have some of this "creeping" inflation in the years ahead, but it should creep slower than it has in the last three years. Many of the wage boosts that forced prices upward during the recession had been granted during the 1955 boom, pegged to the cost-of-living index, and were thus immune from renegotiation until the contract expired. These "guaranteed" wage hikes, plus higher food prices due to a poor crop last year, were behind the recession's persistent rise in consumer prices. Industrial prices leveled off.

The important point is that there's less push ahead, not more. The same reserve capacity that will serve to prevent a shortage of goods also means that business is going to be competitive enough to slow down the "cost-push." Business will have more difficulty passing on any higher costs of production, and labor will meet stiffer resistance across the bargaining table.

When you add it all up: The relation of capacity and demand, the "cost-push", and a few booms thrown in, the long-term rate of inflation doesn't look like it will exceed 1-2% a year averaged out. This *is* inflation, but it is at less than half the rate that has prevailed since World War II, and it is not inflation of the kind that will stand in the way of long-term economic growth.

III. 'Psychological Inflation'

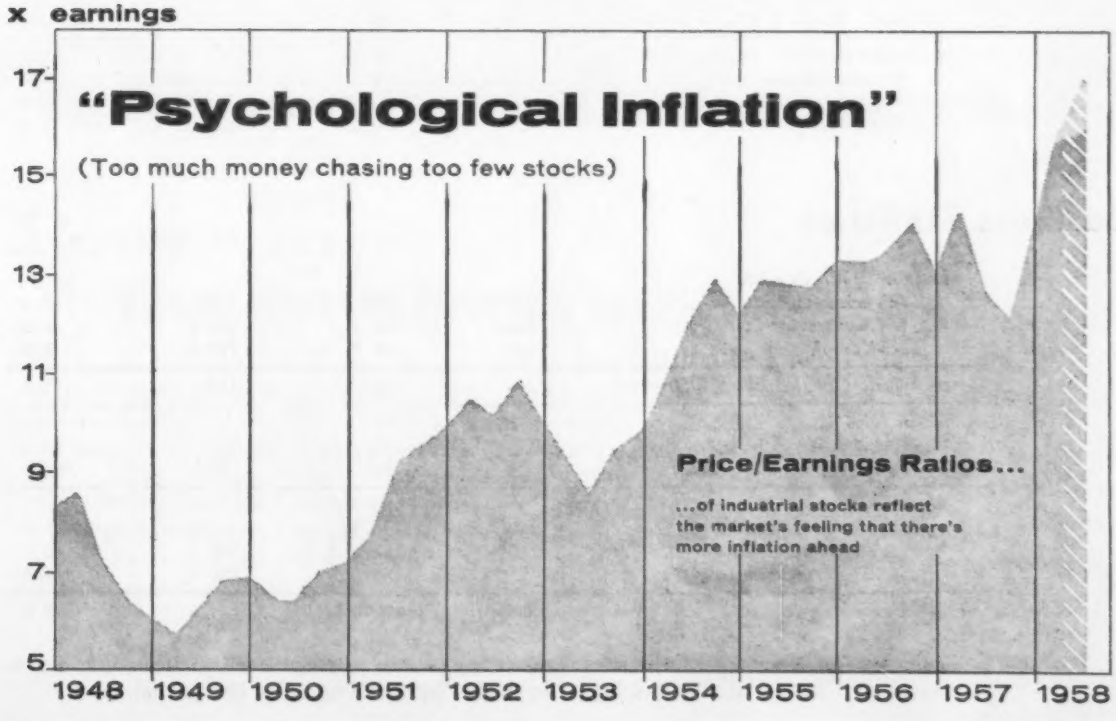
It is a paradox that speculative fears of inflation seem to be reaching a peak precisely when all indications point to the first drop in the consumer price index in two years. Although there are no real signs of serious inflation ahead, and business activity is still below its pre-recession level, the security markets are behaving as if the recession's damage to the economy had been completely repaired and inflation were about to take off at a gallop.

Look at how the fear of inflation has upset the security markets. Bonds, normally attractive at a time of slack demand for money, have fallen sharply in price, while industrial common stocks have already racked up new all-time highs. Yields on high-grade corporate bonds have even exceeded, in some cases, the yields on common stocks.

Investors' fears of inflation show up in rising price/earnings ratios of common stocks. Standard & Poors finds that the average of their listed industrials sold at almost 16 times earnings in the second quarter of this year, and a further rise in the third quarter seems assured. It seems to be a case of "too much money chasing too few stocks," and not enough chasing bonds.

This "psychological inflation" creates some problems of its own. Falling bond prices make the Treasury's fiscal headaches more severe, and place the Fed in the position of having to loosen up on money periodically in order to let the Treasury put through an issue. For business, it means that the whole capital market has been temporarily unsettled; and, since the Fed will be trying to choke off speculative excesses, it also means higher interest rates.

But all these problems don't add up to a major financial crisis that will sabotage long-term economic growth. The situation is not so basically inflationary as most people now think. And there is little likelihood that we can think ourselves into an uncontrollable inflationary spiral.



money chasing too few goods." Combined, these two waves of inflation accounted for more than 75% of the total increase in price level since 1945.

When World War II ended, four years of pent-up consumer demand hit the economy all at once. This demand was reinforced by a credit surplus created by more than $150 billion of wartime federal deficits which the Federal Reserve (owing to a commitment to help the Treasury with its financing) was powerless to control. Factories, retooling from war production, simply could not turn out consumer goods fast enough. By 1948, consumers had bid up prices by about 30%.

At the beginning of the Korean War, the sudden demand for war production was reinforced by a rush of "scare buying" by consumers whose memories of rationing were still fresh. The Federal Reserve Board could still do nothing to tighten credit. Again the demand outstripped manufacturing capacity to produce goods. Consumer and wholesale prices went up about 10% in 18 months.

Contrast that with the present situation. The Federal Reserve Board, having been freed in 1951 from their duty to buy Treasury bonds at par, are now committed to a gradual tightening of credit as we move out of the recession. They have raised the rediscount rate, forcing banks to up their 'prime' rate of interest from 3½% to 4%. They have raised the margin for stocks from 50% to 70%. They have declined to bail out the bond market by purchasing long-term Treasury bonds indefinitely.

At the same time, the ample state of manufacturing capacity insures that there is not going to be any shortage of goods, leading to rampant inflation of the "too much money chasing too few goods" variety, for some time to come. With all this slack in the economy, a boom in demand will pull up production instead of prices.

II. What About 'Creeping' Inflation?

Since 1951 most of our inflation has been of the "cost-push" variety, which might be described as "too many wage demands chasing too little productivity." The effect of this on manufacturers has been to make it extremely difficult to accommodate higher wages without raising prices. Since 1956, the "cost-push" has been largely responsible for price increases averaging between 2% and 3% per year, and this rate held up throughout the recession.

We will still have some of this "creeping" inflation in the years ahead, but it should creep slower than it has in the last three years. Many of the wage boosts that forced prices upward during the recession had been granted during the 1955 boom, pegged to the cost-of-living index, and were thus immune from renegotiation until the contract expired. These "guaranteed" wage hikes, plus higher food prices due to a poor crop last year, were behind the recession's persistent rise in consumer prices. Industrial prices leveled off.

The important point is that there's less push ahead, not more. The same reserve capacity that will serve to prevent a shortage of goods also means that business is going to be competitive enough to slow down the "cost-push." Business will have more difficulty passing on any higher costs of production, and labor will meet stiffer resistance across the bargaining table.

When you add it all up: The relation of capacity and demand, the "cost-push", and a few booms thrown in, the long-term rate of inflation doesn't look like it will exceed 1-2% a year averaged out. This *is* inflation, but it is at less than half the rate that has prevailed since World War II, and it is not inflation of the kind that will stand in the way of long-term economic growth.

III. 'Psychological Inflation'

It is a paradox that speculative fears of inflation seem to be reaching a peak precisely when all indications point to the first drop in the consumer price index in two years. Although there are no real signs of serious inflation ahead, and business activity is still below its pre-recession level, the security markets are behaving as if the recession's damage to the economy had been completely repaired and inflation were about to take off at a gallop.

Look at how the fear of inflation has upset the security markets. Bonds, normally attractive at a time of slack demand for money, have fallen sharply in price, while industrial common stocks have already racked up new all-time highs. Yields on high-grade corporate bonds have even exceeded, in some cases, the yields on common stocks.

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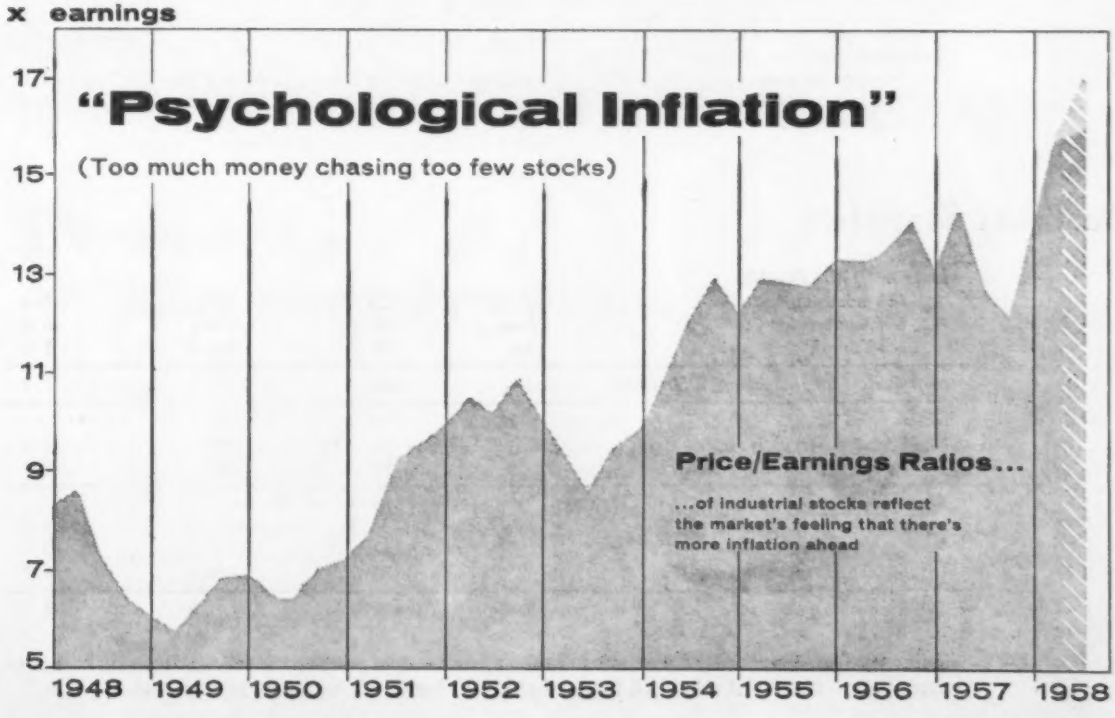
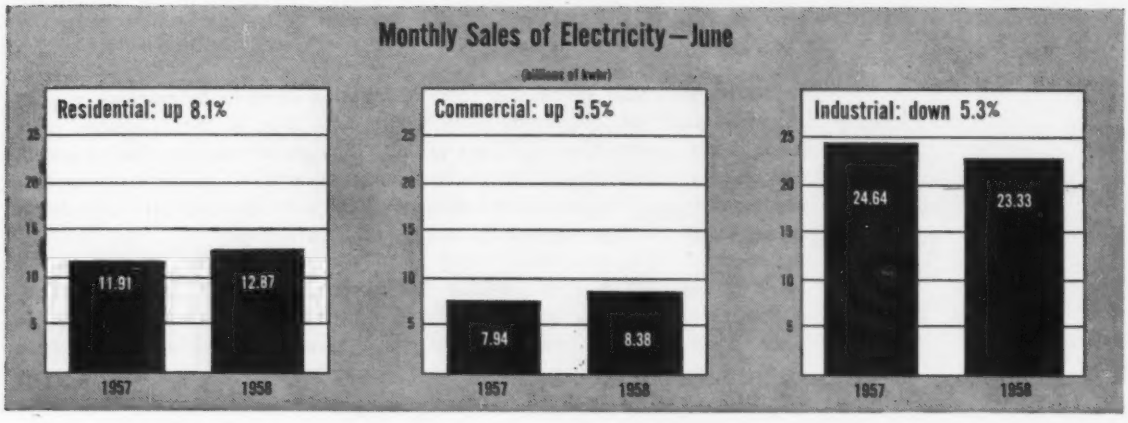




Power Statistics . . .

		Latest Month	Year Ago	Annual Change %
Capacity	June	134.33	124.43	8.0
Peak—Class I Systems (million kw)	Dec.	107.1	102.4	4.6
Estimated Dec. '58 Peak (million kw)	June	117.9	122.8	−4.0
Production—billion kwhr	June	51.93	52.05	−0.2
Hydro		11.58	11.18	3.6
Fuel		40.35	40.87	−1.3
Sales—billion kwhr	June	47.27	47.04	0.5
Residential		12.87	11.91	8.1
Commercial		8.38	7.94	5.5
Industrial		23.33	24.64	−5.3
Other		2.69	2.54	5.9
Fuel Consumption	June			
Coal—million tons		11.40	12.50	−8.8
Oil—million barrels		5.34	6.24	−14.4
Gas—billion cu ft		138.64	125.72	10.3
Net Income Class A & B Co's—$ million	June	114.93	110.52	4.0
Residential Customers—millions	12 mos.	47.14	46.26	1.9
Revenue per kwhr	ended	2.53¢	2.58¢	−1.9
Avg kwhr per customer	June 30	3,290	3,063	7.4
Avg annual bill		$83.24	$79.03	5.3

Business Statistics . . .

Indexes: 1947–49 = 100				
FRB Industrial Production	July	125	135	−7.4
ENR Construction Cost	Sept.	162.2	154.7	4.8
BLS Cost-of-living	July	123.9	120.8	2.6
New Orders for Machinery (1950 = 100)	July	145	147	−1.4
NEMA Sales				
Insulation materials	July	90	127	−29.1
Electric appliances		99	101	−2.0
Wholesale prices				
Motors and generators	June	146.5	141.0	3.9
Transformers and regulators		147.6	147.8	−0.1
Switchgear and fuses		173.8	166.0	4.7
GNP—annual rate—$ billion	2nd qtr	429.0	441.2	−2.8

Significant Changes: Total kwhr sales climbed back above year-ago levels in June, after a two-month lapse. Industrial sales still lagged by 5.3%, but made up some lost ground.

KNOX LEE POWER PLANT
SOUTHWESTERN GAS AND ELECTRIC COMPANY
174,000 kw—4 Units

Power in the Southwest...

The reliable power supply from Southwestern Gas and Electric Company has been a big factor in the growth of the territory it serves consisting of sections of Louisiana, Texas and Arkansas. The Knox Lee Power Plant, one of the company's four major generating stations, was the first to use pressurized gas-fired boilers, a practice which since has gained general acceptance in the industry. Two units of 100,000 kw each are now under construction at the company's Lieberman and Arsenal Hill plants.

FULL COLOR BROCHURE outlining the scope of Sargent & Lundy services will be sent on request.

SARGENT & LUNDY
ENGINEERS

140 SOUTH DEARBORN STREET, CHICAGO 3, ILLINOIS

PARANITE®

3 CONDUCTOR SHIELDED CABLE

Used in Conjunction With

ENIWETOK

Atomic Tests

What is the specific application of this cable? Frankly we haven't been told; but it was precisely engineered to rigid government specifications.

Call in Paranite on your next cable problem —they've been solving them since 1890.

PARANITE WIRE AND CABLE DIVISION

Essex Wire Corporation, Fort Wayne 6, Indiana

MANUFACTURING PLANTS: Birmingham, Ala.; Anaheim, Calif.; Jonesboro, Ind.; Marion, Ind.; Tiffin, Ohio

Sales Offices in all Principal Cities

News About People

RODDIS

TITUS

Roddis New Penelec President

Louis H. Roddis, Jr, has been elected president and a director of Pennsylvania Electric Co. He succeeds O. Titus, who has been elected chairman of Penelec's board of directors.

Roddis, an honor graduate of the U. S. Naval Academy, was deputy director of reactor development for the Atomic Energy Commission before joining Penelec. While in the Navy, he took part in the Bikini atomic weapons tests and worked on various phases of the naval propulsion reactor program, including the power plant design of the U.S.S. Nautilus.

He was a 1957 recipient of the AEC's outstanding service award, and in 1958 he got an Arthur S. Flemming career award given by the Washington Jr Chamber of Commerce to outstanding young men in government.

During the seven years that Titus served as Penelec president, the company enjoyed its greatest period of growth. A Yale graduate, he rose to the rank of captain in the U. S. Army in World War I and joined Rochester Gas & Electric Corp after his discharge. He rose steadily to become executive vice president of New York State Electric & Gas Corp in 1938, and president of Metropolitan Edison Co, and New Jersey Power & Light Co in 1941.

Manhart Promoted to Vp By Raytheon

The election of Charles D. Manhart to the newly-created position of vice president, governmental relations, has been announced by Raytheon Manufacturing Co. Manhart was formerly director of military and government sales for Bendix Aviation Corp.

He joined Bendix in 1935 after graduation from Purdue University and service as a pilot in the Army Air Corps.

In his new position, he will have responsibility for strengthening, expanding, and coordinating all phases of Raytheon's relationships with the Armed Forces and other government agencies.

FORM 406
FLUORESCENT LUMINAIRE

INTERNAL FAN COOLING

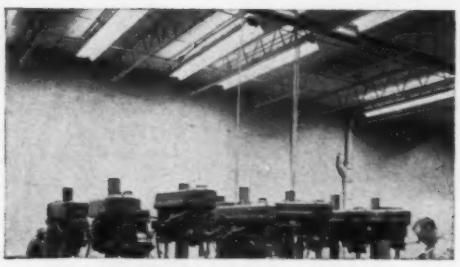
- Air-circulation system—a G-E exclusive—boosts light output of luminaire up to 25%.
- Four Power Groove lamps generate 37,200 lumens.
- No increase in unit cost.
- Completely factory-assembled and tested; shipped in *single* carton.
- Ideal for business streets, traffic arteries, expressways, interchanges, parking lots, shopping centers. 450-3.1

Progress Is Our Most Important Product

GENERAL ELECTRIC

Whatever your customers want from higher output fluorescents...others are already getting...with G-E POWER GROOVES

THESE SATISFIED POWER GROOVE USERS EACH WANTED SOMETHING DIFFERENT . . . AND ARE GETTING IT!



SHAFER VALVE CO., MANSFIELD, OHIO

WHY POWER GROOVES? Because of improved color rendition and lower lamp replacement cost than mercury lamps.

JOHNSON-HILL'S DEPT. STORE, WISCONSIN RAPIDS, WIS.

WHY POWER GROOVES? To get more light (7½ times as much) from the same number of 40-watt lamps.

ERICKSON TOOL CO., CLEVELAND, OHIO

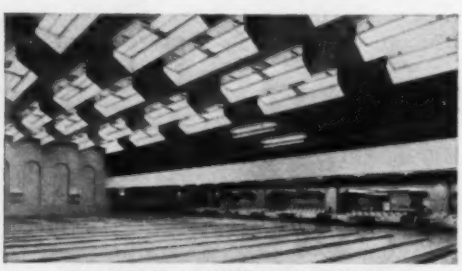
WHY POWER GROOVES? To get higher, more economical production lighting levels (160 footcandles), with no need for supplemental lighting.

GENERAL IRON & METAL CORP., CHICAGO, ILL.

WHY POWER GROOVES? To increase worker efficiency, speed-up production, reduce customer complaints.

CONVAIR, SAN DIEGO, CALIF.

WHY POWER GROOVES? To get the lowest operating cost compared to filament and mercury, and the highest level of light per watt.



PLA-MOR BOWLING ALLEYS, KANSAS CITY, MO.

WHY POWER GROOVES? To provide Pla-Mor lanes with a revolutionary, glare-free lighting system—superior to that in any other bowling center.

Give your customers the newest fluorescent lighting that is endorsed by enthusiastic users all over the country. That *one*, of course, is the *tried-and-proved* General Electric Power Groove Lamp. Think of it! Almost twice the light of High Outputs—more than 2½ times the light output of slimlines! Power Groove users save up to 20% on initial cost, and keep maintenance at rock bottom at the same time. It'll also pay you to investigate the use of powerful G-E Power Grooves for street lighting. A number of manufacturers now offer luminaires made especially for them. For the whole Power Groove story, write: General Electric Co., Large Lamp Dept. C-839, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

NEES Names Lasselle Vice President

Howard G. Lasselle has been named vice president and general purchasing agent of New England Electric System, succeeding Robert E. Shillady, who retired on Sept. 1.

Lasselle, a native of New England, joined the company in 1927 after graduation from Worcester Polytechnic Institute. He became assistant superintendent of distribution for Narragansett Electric Co in 1948, and was named assistant purchasing agent of the parent company last March. In his new post he will direct all company purchasing.

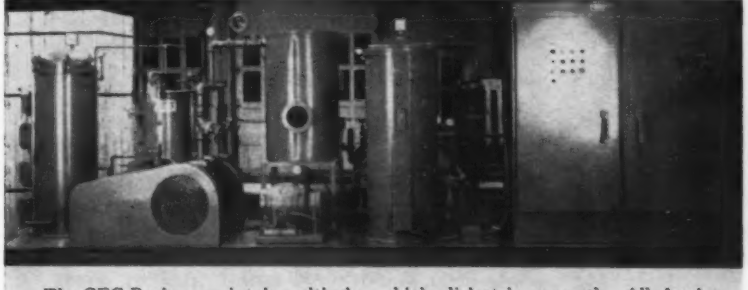
Restofski Heads Magazine

Harry Restofski, vice president of West Penn Power Co until his retirement July 31, will become publisher of a new magazine, "Electrical Living."

Prominent in many industry activities, Restofski completed 44 years of service with West Penn.

The new publication will be distributed by utilities on a franchise basis.

COMMONWEALTH EDISON chooses CFC PURIVAC to purify insulating oil for underground pipe-type cables



The CFC Purivac maintains critical specifications of insulating oil used in over 15 miles of underground 138,000 volt pipe-type cables by Commonwealth Edison Company of Chicago.

CFC Purivac filters, dehydrates and degasifies insulating oil in one continuous operation. Purivac meets these rigid requirements of Commonwealth Edison: maximum gas content of 1.0% under standard conditions of 760 m.m. of mercury and Zero C. In addition, moisture content is reduced to only 5 to 15 parts per million, which contributes greatly to the oil's high dielectric strength. All foreign matter is removed by Purivac's multi-cartridge filter. Result: clean, dry, gas-free oil for unlimited service in the underground high-pressure cable.

For a booklet describing the Commonwealth Edison installation in detail, write to Department EW.

COMMERCIAL FILTERS CORPORATION
Melrose 76, Massachusetts
Plants in Melrose, Mass. and Lebanon, Ind.

"TEE-LIGHTING"
FLUORESCENT SYSTEM

NEW STREET-LIGHTING CONCEPT

- Ideal for "prestige" lighting of business whiteways.
- Highest utilization efficiency of any fluorescent system.
- Greater driver comfort.
- Uni-directional reflectors in parallel units aim light across street.
- Parallel fluorescent units, 18,600 lumens each; transverse unit, 18,600 to 55,800 lumens. 450-3.2

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GENERAL ELECTRIC

NOW Is The Time To Invest In The West

The West's share of the nation's electrical power industry expenditures is growing bigger every year, following this pattern:

1949.....16.1%
1954.....17.4%
1957.....21.0%
1958.....21.5%

At the present time the West with 15% of the country's people consumes 19.2% of the electrical energy, builds 26% of the country's homes, and accounts for 24.6% of the engineered construction backlog.

That's why many alert electrical manufacturers right now are profitably stepping up manufacturing, marketing and advertising efforts in the West.

WHEN WE LOOK AHEAD A FEW YEARS THE IMPORTANCE OF TODAY'S SELLING INVESTMENT IN THE WEST BECOMES EVEN MORE SIGNIFICANT

Between 1959 and 1975 total U. S. population growth, will be 20.9%—11 Western States' increase will be 50.1%. The West will add 14.8 million people in this period, far more than any other region.

COMING IN NOVEMBER
26TH ANNUAL
BUYERS' GUIDE AND DIRECTORY

More than 12,800 copies will be used during 1959 by Western electrical equipment buyers in 12 Western states and Hawaii. Check your nearest McGraw-Hill office for closing dates.

In these next 16 years the West's growth means the addition of a market duplicating the entire state of California as it is today. It means building new homes equal to all those in three cities the size of Los Angeles at a cost of about $100 billion. It means providing over 2,000 new schools; thousands of stores and other commercial structures and about $35 billion worth of new manufacturing plants.

THIS IS WHY IT'S WISE TO ACT NOW TO PROTECT YOUR PRESENT SHARE OF THIS GREAT GROWING ELECTRICAL MARKET AND INSURE YOUR "% OF THE AVAILABLE" IN THE FUTURE.

Regular advertising in ELECTRICAL WEST is an important part of your Western Market investment. Its 12,500 subscribers are the electrical industry of the West. Its circulation growth parallels the growth of the market. Nowhere else can electrical equipment sales efforts be backed up with the impact, depth and scope offered by advertising sales messages in this magazine.

NOW IS THE TIME TO INVEST IN THE WEST. NOW IS THE TIME TO BE ADVERTISING REGULARLY IN ELECTRICAL WEST.

ELECTRICAL WEST

68 Post St.,
San Francisco 4, California
A McGraw-Hill Publication

Spokesman of the Electrical Industry of the West for 70 Years

PERSONAL BRIEFS

Gulf Power Co has made the following promotions: **Robert F. Ellis, Jr,** supervisory and planning engineer, has been named assistant to the general manager; **Edward E. Cobb,** distribution engineer, to assistant to the operating manager; and **Judson M. Gillespie,** supervisor of transmission, supervisor of transmission and distribution.

George S. VanAntwerp has been named assistant to the executive vice president of Philadelphia Electric Co.

Virginia Electric & Power Co has appointed **Duane W. Stewart** commercial engineer for the Fredericksburg district.

James W. Smith has been appointed secretary of the Public Service Co of Oklahoma, succeeding **Miss Nida Boaz,** retired.

Atomic Energy Commission has made these changes in its staff organization: An Office of Industrial Relations has been established with **Oscar S. Smith** in charge. The Division of Organization and Personnel becomes the Office of Personnel headed by **Arthur L. Tackman.**

F. L. Rimbach, director of the agricultural development department of New England Power Service Co, has been elected chairman of the North Atlantic section of the American Society of Agricultural Engineers.

Rural Electrification Administration has named **Norman H. McFarlin** as an assistant administrator.

Charles D. Sayre has been named assistant public relations director for Consumers Public Power District.

Quebec Hydro-Electric Commission has announced these appointments:

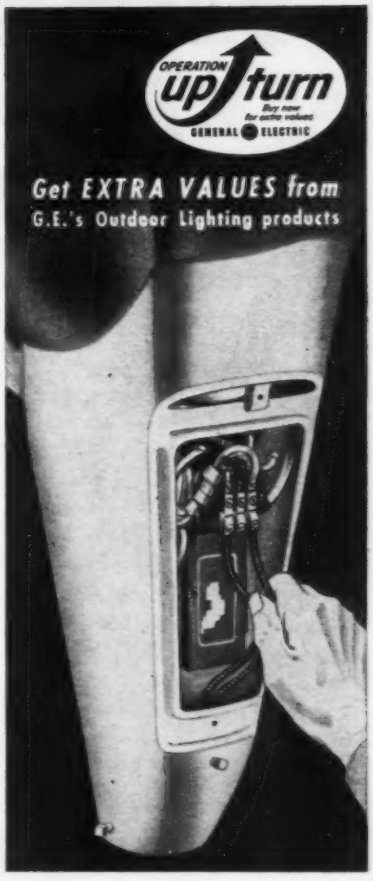
ADVERTISEMENT

Here Is Something New In A 200 Amp. Socket that Mr. Charles Milbank, president of Milbank Manufacturing Co., would like for you to know more about. All adjustments are made from the front. The jaw pressure is applied after the meter is in position. No extra side clearances are required. It is designed for growing loads and available in either steel or aluminum; with manual or automatic by pass. What's more, it's priced right!

Why not write Mr. Milbank for a sample and more information? Address –

Milbank Manufacturing Company
1111 Virginia **Kansas City, Mo.**

You Can Bank on Milbank *Plants in Kansas City, Mo. & Kokomo, Indiana*



"POWER PACK"
MERCURY LUMINAIRE

NEW BUILT-IN BALLAST

- Only two terminal connections—saves up to 30 minutes per unit installation.
- Eliminates need for ballast-adapters or transformer-base poles—saves $30 to $65 per pole.
- Same outstanding lighting efficiency you have experienced with the General Electric Form 400—best in the industry.
- Low ballast losses. 450-3.3

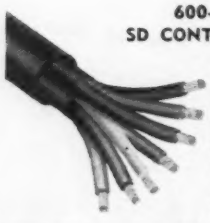
Progress Is Our Most Important Product

GENERAL ELECTRIC

SUPERIOR
POWER and CONTROL
CABLES

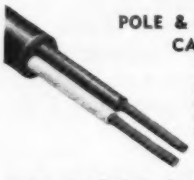
Insulated and jacketed with modern plastics

600-1000V SD CONTROL CABLE



Flexible stranded conductors insulated with polyethylene. Nylon jacket over insulation provides extra protection. Mylar tape over cabled conductors, polyvinyl chloride outer jacket.

POLE & BRACKET CABLE



For use from street lamp base or overhead circuit to lighting fixture. Insulation is polyvinyl chloride, jacket is polyethylene. Operates at relatively low voltage between conductors, high voltage from conductors to ground.

600-1000V STATION CONTROL CABLE

Conductors insulated with polyethylene. S. I. C. rating (2.3%) and Power Factor rating (.0003) remains constant at high frequency. Mylar tape over cabled conductors, polyvinyl chloride jacket overall.

FIGURE 8 POLE & BRACKET CABLE

For 0-600V service. Insulated with polyvinyl chloride. Does not deteriorate with age or weather, resists abrasion and mechanical damage, is not affected by common chemicals nor electrolysis. Will not support combustion.

SUPERVISORY CONTROL CABLE

Conductors polyethylene or polyvinyl chloride insulated. Polyethylene or polyvinyl chloride jacket. With or without shielding. Color-coded to IPCEA specifications or as desired. Composite types with twisted pairs available.

CATHODIC PROTECTION CABLE

Polyethylene insulation with polyvinyl chloride jacket or special polyethylene jacket. Highly resistant to most acids, alkalies and chemicals usually found in corrosive soil areas.

STREET LIGHTING CABLE

Thermoplastic series lighting cables for direct burial, in ducts or overhead. Highly resistant to earth acids and alkalies, moisture, sunlight and weather. With either polyethylene or polyvinyl chloride insulation and either polyethylene or polyvinyl chloride jacket. Shielded types available.

BUS DROP CABLE

Designed especially to provide flexible branch circuit runs between overhead bus feeders to shop and plant equipment. Conductors are color-coded. Insulation and jacket are polyvinyl chloride.

SUPERIOR CABLES are manufactured under a rigid quality control system and are thoroughly tested prior to delivery to assure satisfactory performance.

For complete information and prices, write

SUPERIOR CABLES

SUPERIOR CABLE CORPORATION

Hickory, North Carolina

3465

Roger Tanguay has been assigned to the third section of Beaurharnois Powerhouse. Engineer Pierre Brillon has been transferred from Bersimis I to Bersimis II Powerhouse.

C. R. Simmons, chief of the Palisades field branch, Power Division, Minidoka Project, Idaho, has been named plant superintendent at Priest Rapids Dam of the Public Utility District of Grant County. **Jess Barksdale,** assistant chief of operations and maintenance, U. S. Corps. of Engineers, McNary, Ore., has been appointed assistant plant superintendent at the dam.

A. E. Rhodes has been appointed manager of power production for Public Service Co of New Mexico. He was formerly chief of utilities operations for the Atomic Energy Commission at Los Alamos.

Argonne National Laboratory has appointed **Dr Roger H. Hildebrand** as associate laboratory director for high energy physics.

Jerome D. Luntz, editor of Nucleonics magazine, has been appointed associate publisher. He will continue as editor.

Roy Stott has retired as manager of the Greenwood Utilities in Greenwood, Miss.

OBITUARY

Edward A. Mueller, 76, retired head cashier of Public Service Electric & Gas Co, died in East Orange, N. J., Aug. 30.

William H. Herbeck, 66, retired general superintendent of hydroelectric generation at Pacific Gas & Electric Co, died Aug. 25 in San Francisco after a long illness.

John E. Fredericks, 72, retired general superintendent of engineering for the general maintenance departments of Rochester Gas & Electric Corp, died Sept. 4.

Marshall O. Leighton, 84, retired Washington engineering consultant, died Aug. 29 in his sleep at his home in Cape Elizabeth, Me.

Sales Assignments

COMPANY STAFFS

Graybar Electric Co has appointed E. R. Yonkers as eastern district manager. G. J. Kennedy succeeds Yonkers as district sales manager at Queens Plaza in the New York District.

American - Standard, American Blower Division, has named J. A. McCain eastern regional manager; R. C. Wilts, New York branch manager; and H. B. Barron, eastern regional manager, power plant equipment. They will be located at 39 W. 39th St, New York 18.

Philco Corp has named William H. Bradbury field operations manager.

Electric Storage Battery Co, Exide Industrial Division, has appointed James G. Bouska sales manager of the Los Angeles branch, succeeding Robert J. Muth, who was transferred to Philadelphia as field sales manager. Bouska will be in charge of all sales and service of industrial batteries in southern California, Arizona, western New Mexico, southwestern Texas, and Mexico. His headquarters are at 1043 S. Grand Ave, Los Angeles.

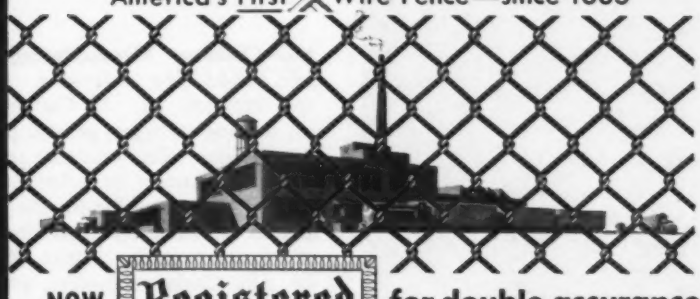
RT&E Corp has made these appointments: Robert H. Manning will represent the company and handle its complete line of distribution transformers and protective equipment in Montana and a portion of Wyoming. His address is Box 394, Butte. Kermit H. DuBois will cover Washington state.

Westinghouse Electric Corp has named Smith T. Groves southwestern regional manager with offices at St. Louis, Mo.

Alco Products, Inc, has made these appointments: T. E. Fryar has been named renewal parts and warehouse manager at Los Angeles. James L.

PAGE chain link FENCE

America's First Wire Fence—since 1883



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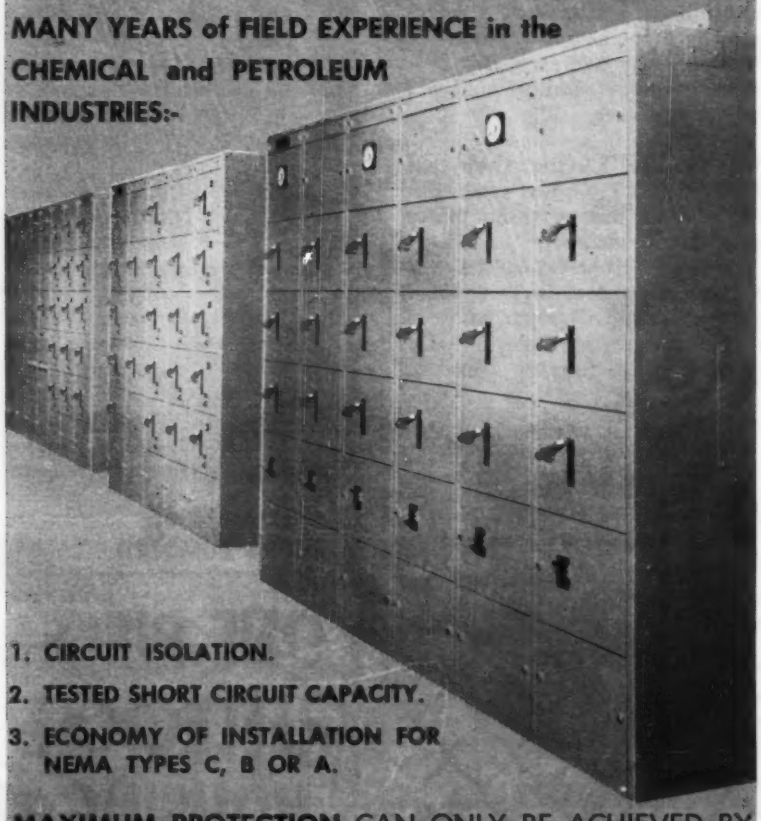

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Layton, former transportation products sales representative in New York, has taken over a similar position in Los Angeles sales office. Robert G. Koob succeeds Layton from his post as service manager.

Hotpoint Co has promoted Benjamin B. Yanzito, Jr, to sales manager, Rockford, Peoria, and South Bend markets.

H. K. Porter Co, Inc, has appointed Roy Davis to the home office sales department as coordinator for customers and field representatives in Cleveland, Atlanta, and West Coast areas.

Chase Brass & Copper Co has named Arthur W. Schriewer eastern regional stainless steel specialist. He will make his headquarters at the Chase New York warehouse in Maspeth, L. I., and will cover the company's seven eastern sales districts and warehouses.

General Electric Co has named John F. Smith manager of industrial and specialty distributor sales with headquarters in Schenectady, New York.

Weston Instruments division, Daystrom Corp, has appointed Wendell E. Matchett Chicago district manager.

Allis-Chalmers Manufacturing Co has made the following sales appointments: E. T. Cuddeback has become manager, general products division sales, southeast region with headquarters in Atlanta, Ga. He will be responsible for the promotion, planning and coordination of sales through the district offices, for Allis-Chalmers motors, pumps and motor controls, and Texrope drives. George G. Brooks has been named manager of products sales, control department.

Whirlpool Corp has appointed Thomas F. Bartley new field sales manager of RCA Whirlpool home appliances. He will assist general sales manager John Crouse in the coordination and supervision of the activities of regional and district managers and will provide marketing help and counsel to the company's 78 wholesale distributors in the U. S.

units will be in operation on our system," Whelchel said. The 60-Mw Humboldt Bay nuclear unit, which Whelchel described as "an enlarged, advanced Vallecitos, rather than a scaled-down Dresden," is planned for 1962 completion.

First American use of geothermal steam for commercial electric production will be a PG&E 12.5-Mw station, providing the plans are approved by the Public Utility Commission. The unit will use 100-psig, 348F earth-generated steam, with sufficient steam discharge to a barometric condenser to supply cooling tower makeup, Whelchel stated. Initial plant and transmission costs will be about $2 million.

Research and development to eliminate the boiling water reactor containment sphere is underway at PG&E expense, Whelchel continued. The "pressure suppression" system, if successful, will be used at Humboldt Bay. It uses a large, simple, and inexpensive sealed underground water tank to condense steam released during nuclear incident, and prevent reactor enclosure pressure buildup.

Scarcity of U. S. pumped storage hydro installations is due to availability of standard hydro sites for more economic development. With approaching hydro-saturation, however, pumped storage will become increasingly attractive, predicted H. H. Roth, Allis-Chalmers Manufacturing Co. Potentially, pumped storage power will have high value in maintaining nuclear plants at constant load, thus minimizing overall generation costs, he said.

Pumped storage is considered seriously in California's ultimately $12-billion Water Plan, which will move water from surplus to deficient areas, said H. O. Banks, State Director of Water Resources. The development envisages 260 dams, reservoirs, power plants, and pumping plants, and a state-long aqueduct system.

Ultimate pumping demand of

(*Continued on page* 176)

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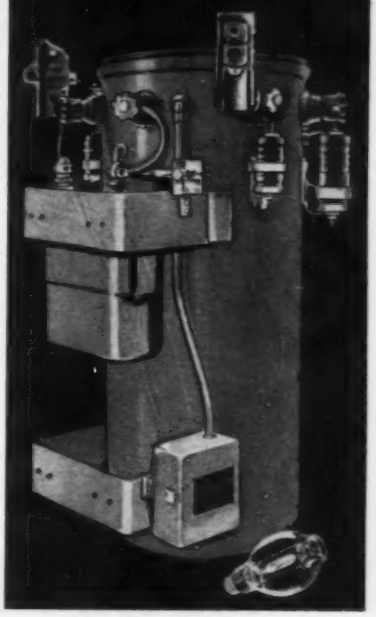

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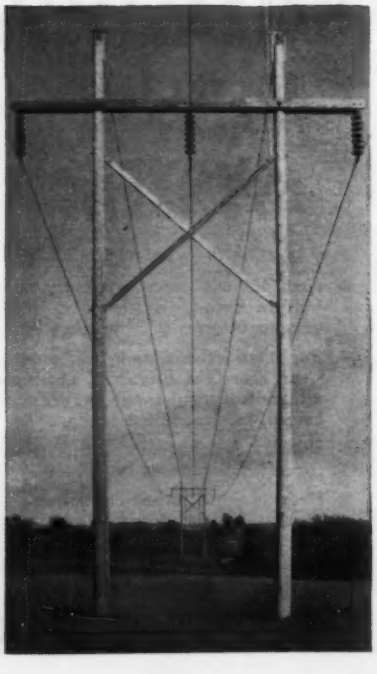

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AIEE Meets

(*Continued from page* 175)

12,300 Mw and 49 billion kwhr annually will be partially balanced by 7,800 Mw of new hydro with 39 billion kwhr dependable annual production. Feasibility is enhanced if utilities will sell low-cost off-peak pumping energy and will buy higher-value peaking energy, Banks said. The state's constantly decreasing hydro/steam ratio aids attractiveness of low-incremental-cost peaking hydro, he added.

Implementing this concept, one pumped hydro plan would recover energy as water dropped through storage-type hydro along the aqueduct. Another scheme, more nearly "pure" pumped storage, would utilize pump turbines on lift parts.

Utility spinning steam reserves also could produce low-cost interruptible energy, Banks added.

The impact of nuclear electric power on application of pumped storage in California can't be felt until installed nuclear capacity equals system base load, probably around 1990, said F. J. Groat, California Department of Water Resources.

Depicts Reactor Backup

Instrumentation for nuclear power plants need not be much more complex than for equivalent fossil-fuel plants, said L. Kornblith Jr., General Electric Co. Experience at the GE-PG&E Vallecitos boiling-water reactor plant shows that steam and electrical instrumentation can follow very nearly the standard power plant practice, and reactor instrumentation can be much simpler than proposed for some installations.

A statistical reliability of 99% was established for six 5-Mw turbogenerators supplying emergency backup to two GE plutonium production reactors, in a series of 300 load pickup tests over 18 months. Two generators normally operate at 1-Mw load in parallel with normal supply to each reactor, explained W. R. Moon. In event of Bonneville Power Administration power failure, the two supply emergency cooling water demand for considerable time after reactor scramming. As one generator can meet the demand, system reliability is 99.99%.

(*Continued on page* 178)

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AIEE Meets

(*Continued from page* 176)

Motor-driven exciters will be accepted by California Electric Power Co on its 60-Mw steam units as the result of satisfactory operation on staged auxiliary bus transfer tests, reported J. H. Zornes. Transfer of the station auxiliary bus between alternate sources, with faster relaying now available, showed no serious effect on an amplidyne-controlled motor-driven exciter. Elimination of geared exciters on the generator shaft is expected to facilitate brush maintenance, according to Zornes.

How to Plan Generation

Most economic location, size, type, and timing of generation additions can be determined on a long-range planning basis by a method described by T. W. Schroeder and G. P. Wilson, Illinois Power Co. The method involves comparison of future annual costs on a present worth basis for each practicable plan of system development.

First step is to establish several long-range expansion patterns of generating addition size and timing, with unit size and minimum system reserves as parameters. Into these patterns are fitted various combinations of unit type and location, in a series of steps handled on a high-speed digital computer. Fuel costs, other operating expenses, and transmission fixed and variable costs are introduced in present worth form for the period under consideration.

At each step, certain development plans are rejected by the computer as a result of fed-in instructions on site limitations, etc. The final result determines the most economical location, size, type, and operating date of the next unit to be installed. The study is repeated prior to each succeeding unit, to update system growth and cost data.

Nodal representation of networks with an iterative solution is superior to the mesh approach with matrix inversion in load flow and short circuit caluculation by high-speed digital computer. When mutual reactances are included, the advantage is more pronounced, according to Mrs. J. C. Siegel and G. W. Bills, North American Aviation. Load currents and transformer ratios also can be handled more easily.

The difficulty of inverting large system matrices, cited by the authors as another disadvantage of the mesh approach, was disputed by M. J. Lantz, Bonneville Power Administration. Little is gained by increasing the network beyond moderate size, he said, as external system effects can be represented adequately by equivalent circuits. The mesh method provides direct solution with predictable solution times and retains the analyzer approach, he said.

Much investigation and research on the use of high pour point insulating oil was urged by an AIEE working group on West Coast substation oil handling, in a report presented by PG&E's J. L. Buckley. Though oil higher than —30F pour point should not be used in areas having below-zero minimums, the report found many utilities have inadequate tests, including pour point, to determine whether used oil can be reclaimed economically.

Reason for and quantity of high pour point oil on utility systems must be determined as a first step, the report continued. All oil removed from large equipment should be tested for pour point to avoid mixing with low pour point oil, as the effect of poor on good oil is completely out of proportion to the mixed quantities.

Multi-station supervisory control operation, where two or more stations are controlled from common equipment, should not be used unless separate channels are impractical, advised J. R. Boston and K. E. Shank, BPA.

Remote Control Is Topic

Four such BPA installations, using pulse code supervisory on single-frequency power line carrier, have given trouble. In one case, two remote stations pulsed each other, causing improper breaker operation, when carrier receiver relays misfunctioned. Modifications to prevent recurrence imposed more complex coding and reset of the supervisory on receipt of an unused code combination generated by erratic relays or by noise.

Full-current, low-voltage heat runs on new pipe-type cable were advocated by C. M. Buck and F. B. Schullerts, PG&E. These accelerated tests permit checking temperature performance long before the cable actually carrys its ultimate design load. Thermocouples at questionable locations may ferret out and evoluate hot spots; test load cycling can precondition the cable by thoroughly permeating possible voids with the pressure medium; and, data are provided for the calculation of capability and temperature rise, including mutual heating effects.

Cuts Underground Costs

The semi-buried transformer enclosure is the key to lower costs in residential underground, said R. C. Blankenburg, Southern California Edison Co. His company's experience now extends to nearly 10,000 lots, with many in the "modified lower cost" bracket using this enclosure.

Typically, the 3 x 4½-ft concrete block wall housing, with fabricated half-round steel hood, costs about $300 vs $1,000 for a 6 x 8-ft vault. Use of the housings reduces secondary lengths and permits fewer homes per transformer, he said. Self-fused overhead-type transformers are used.

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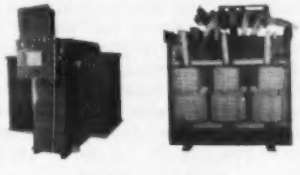

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• **AIR CONDITIONERS:** 56-p booklet, No 786 describes line of air conditioning units for commercial buildings, office buildings, factories, etc. Includes available standard accessories, steps in selection of basic unit and components, capacities, standard arrangements, dimensions and suggested specifications. American Air Filter Co, Louisville, Ky.

• **CRANES AND SHOVELS:** New standard for power cranes and shovels to establish uniform methods for guidance of users in specifying cranes and shovels and in presenting data concerning them is contained in 24-p booklet, Standard CS 90-58. $0.20. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

• **SPEED DRIVES:** Booklet EN 64 discusses Ultraflex E Electronic Packaged Drive and Booklet EN 65 tells of Ultraflex M Magnetic Amplifier Packaged Drive. Cutler-Hammer, Inc, 235 N. 12th Street, Milwaukee 1, Wis.

• **VENTILATED MOTOR:** Significant design elements of two-pole straight-up ventilated motor are shown in cutaway section and ventilation method is described in 8-p bulletin, 1300-TEC-1134. Electric Machinery Mfg Co, Minneapolis 13, Minn.

• **HIGHWAY LIGHTING:** 24-p folder LS-23 illustrates and catalogues highway pole designs as well as various overhead sign mounting arrangements. The Union Metal Manufacturing Co, Canton 5, Ohio.

• **INSULATION:** 28-p booklet has been prepared for electrical contractors, engineers, chief plant electricians, and others who specify for electrical installations. Contained are an analysis of the chemical structure of butyl insulation and a description of the manufacturing processes. National Electric Products Corp, 2 Gateway Center, Pittsburgh, Pa.

• **INFORMATION SYSTEMS:** Field measurements of process variables, made locally or remotely, which are received and displayed in digital form by Metrotype information systems are illustrated in 8-p bulletin E72-1. Bailey-Meter Co, 1050 Ivanhoe Rd, Cleveland 10, Ohio.

• **LIGHT CONTROLS:** Bulletin PA 569 contains descriptive data on Photoswitch Light Control, an automatic on-off control for lighting systems keyed to outdoor light conditions. Electronics Corp of America, 1 Memorial Drive, Cambridge 42, Mass.

• **UNDERGROUND CONNECTORS:** 92-p catalog features recently expanded line of over 1,000 underground connectors and fittings for use with underground distribution networks and industrial applications. Contains specifications and dimensional data. Dossert Manufacturing Corp., 249 Huron St., Brooklyn, N. Y.

• **ELECTRODES:** Series of reference data charts cover comparative bronze electrodes, melting rates and efficiencies electrode and filler rod specifications, and recommended welding currents. Ampco Metal, Inc, 1745 S 38th St, Milwaukee 46, Wis.

• **WIRING DEVICES:** 24-p manual gives engineering details and installation instructions, explains mechanical and electrical aspects, of remote-control wiring devices. Pyramid Instrument Corp, Remcon Div, 630 Merrick Rd, Lynbrook, N. Y.

• **CONTROL SWITCH:** Catalog sheet describes Uni-Tog starting and speed control switch, a single-unit device for all makes of universal, capacitor, and split-phase motors. Kirkwood Commutator Corp, 4853 W 130th St, Cleveland 35, Ohio.

• **INSULATION SYSTEM:** Impervious insulation system for motor and generator stator coils is detailed in bulletin 05B8341A. Important properties attributed to "Silco-Flex" insulation are described. Allis-Chalmers Mfg Co, Milwaukee 1, Wis.

• **GE PUBLICATIONS:** Available from General Electric Co, Schenectady 5, N. Y. unless noted.

Oil Switch: Bulletin GEA-6554A, 4 pp, describes FKC oil switches rated 14.4 kv, 200 amp, for remote and manual operation of capacitor, outdoor lighting and load break applications.

Fuse Cutouts: Bulletin GEA-1816C, 8 pp, describes design features, application data, ratings and dimensions of open-dropout fuse cutouts, 7.8 and 15 kv, 100 amp.

Unijunction Transistor: Two brochures, GP-176. One has 6 p of information which includes specifications for types now available, basic application information, six characteristic curves for the devices and six typical unijunction circuits. Other brochure contains a summary of unijunction transistor circuits. Twelve of the more basic circuit functions are illustrated using a single basic circuit. Semiconductor Products Dept, GE, Syracuse, N. Y.

• **TERMINALS:** 8-p brochure gives application and technical data on telemetering, control and telegraph terminals, and accessories. Radio Frequency Laboratories, Inc, Boonton, N. J.

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Electrical Distribution Engineer with nine years experience in Southeast desires to relocate. B.S. in Civil Engineering. Age 32. PW-8897, Electrical World.

2500 KVA MASTER UNIT SUB-STATION

GE-1957, Never Used

Outdoor type, 3 phase, 60 cycles, 13,800 volts primary, 2400 volts secondary. Assembled in three (3) sections as follows:

A. Incoming Line Section

1—Cable Selector Switch for two (2) 13,800 volts, 35 OMCM cables.
1—Auto blast interrupter switch, type SE-5, with key lock coordinated with transformer secondary breaker.

B. Transformer Section

1—2500 KVA, 3 phase, 60 cycles, 13,800/2400 volts, liquid filled, with manual tap charger.

C. Outgoing Section

1—Control panel and 10 KVA, single phase, 60 cycle, 2400/240/120 volt transformer for electric heaters and lights.
4—Type AM 4.16-50, 1200 A magneblast air circuit breakers. Control panel contains three (3) current transformers, ammeter, and ammeter selector switch.

EDDYSTONE DIV.
BALDWIN-LIMA-HAMILTON
PHILADELPHIA 42, PA.
Contact: H. L. Newlin
Phone: SAratoga 6-9300

CORROSION ENGINEERS

Several attractive openings are available with a highly regarded, major Eastern engineering company. These positions require Electrical Engineering graduates with 5-10 years experience in corrosion control investigation, corrosion testing and solution of corrosion problems on pipelines, underground cables, power plant structures, piers, wharves, water and oil storage tanks, etc.

These positions offer ample opportunity for professional growth and personal achievement. Considerable travel within the USA with possibilities of some overseas work. We invite you to investigate these opportunities by forwarding a complete confidential resume.

P-8600, Electrical World
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

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Readers Forum

Use Them Till They Burn Up

To the Editor:

"Can You Afford Old Transformers?" (EW April 21 p 68) was most interesting, even if I can't agree with the conclusions. After reading it, I went through our transformer cards, picking out all previous to 1920.

The core loss on many has been increasing over the years, however, not at the rate shown in the article. Using the worst set of losses I could find, it would take over forty years for a new transformer to pay for itself and the changeout labor by lowering losses.

However—how is the excess magnetizing kvar going to show on a kwhr meter so that you can charge it at so many mils per kwhr? The whole thesis hinges on this point: that the magnetizing kwhr is costing the utility the same amount as a kwhr of energy. It looks like we are going to be using these old transformers until they burn out or have to be changed out because of load growth.

J. W. K. Pomeroy, P. Eng.,
Overhead Engineer
City of Calgary
Electric Light, Heat and Power System
Calgary, Alberta,
Canada

Governor Switches States

To the Editor:

Recently Electrical World made reference to a ruling of the Wisconsin Public Service Commission that "propaganda" advertising was not allowable as an operating expense for rate making purposes. It was also stated that Minnesota and Texas have also taken this position.

We have asked both the Minnesota Railroad and Warehouse Commission and Texas Railroad Commission to advise the Federal Power Commission of any action they have taken in this regard. A reply has been received from the Minnesota Commission stating "the Commission does not have jurisdiction over power companies and no such provision has been made in our telephone orders". To date, no reply has been received from the Texas Commission.

Mr. J. H. Gutride
Secretary
Federal Power Commission
Washington 25, D. C.

EW was in error. Governor V. W. Thompson of Wisconsin who made the original statement we quoted has advised us he had Connecticut and California in mind.

The *Complete* Address . . .

in 106 U. S. cities requires a postal zone number. Your mail and our mail will go quicker both ways by including it.

Advertising Index

Allis-Chalmers Mfg. Co.....8, 9, 75, 92
American Chain & Cable Co., Inc., Page Fence Ass'n..... 173
American Pamcor, Inc..... 76
Anaconda Wire & Cable Co.....50, 51

Babcock & Wilcox Co.....30, 31
Bailey Meter Co.....44, 45
Blackburn Corp., Jasper..... 71
Brewer-Titchener Corp. 128
Bristol Co. 40
Brown Company 142
Brown Boveri Corp. 33
Buffalo Forge Co.....72, 73
Burndy Corp. 32

Cavalier Corp., Electric Heating Div. 65
Central Transformer Corp..... 89
Chance Co., A. B..... 126
Colorado Fuel & Iron Corp., Wickwire Spencer Steel Div..... 177
Commercial Filters Corp..... 169
Copper & Brass Research Ass'n...34, 35
Copperweld Steel Co..... 6
Cornell-Dubilier Electric Corp....124, 125
Crescent Tool Co..... 86

Delta-Star Electric Division, H. K. Porter Company, Inc..... 135
Directory of Engineers..... 180
Dossert Mfg. Corp..... 139

Ebasco Services Inc..... 10
Electric Service Works, Delta-Star Electric Division, H. K. Porter Company, Inc. 135
Electrical Engineers Equipment Co... 54
Electrical West 170
Electro-Motive, Div. General Motors 136, 137
Engineers, Directory of..... 180
Enjay Company, Inc..... 129
Fluor Corporation 69

Gai-Tronics Corp. 130
General Cable Corp.....144, 145
General Electric Co.
Apparatus Dept.....2nd Cover
117, 167, 169, 171, 173, 175, 177, 179
Large Lamp Dept. 168
Gilbert Associates, Inc..... 157
Graybar Electric Co., Inc..... 7
Gulf Oil Corporation.....16, 17

Highway Trailer Co. 66
Holophane Co., Inc. 119
Hotpoint Co. 63
Husky Products, Inc. 132

I-T-E Circuit Breaker Co., Switchgear Div. 46, 47
Indiana Steel & Wire Co., Inc..... 152
Infilco, Inc. 48
Ingersoll-Rand 143

Jenkins Bros. 62

KPF Electric Co. 120, 121
Kaiser Engineers Div., Henry J. Kaiser Co..... 74
Kearney Corp., James R.....90, 91
Kellogg Switchboard & Supply Co.... 55
Kidder, Peabody & Co..... 160
Kuhlman Electric Co. 84, 85

Line Material Industries.25, 26, 27, 28, 29
Loeb, Rhoades & Co..... 175

McGraw-Hill Book Co. 180
Milbank Manufacturing Co. 171
Minneapolis-Honeywell 150, 151
Moloney Electric Co.....4th Cover

Nelson Electric Mfg. Co..... 148
Northeastern Engineering, Inc..... 174

Ohio Brass Co.....38, 39, 80, 81
Okonite Co. 4
Orangeburg Mfg. Co., Inc..... 131

Page Fence Ass'n. American Chain & Cable Co., Inc... 173
Page & Hill Inc. 176
Paranite Wire & Cable Div., Essex Wire Corp. 166
Pennsylvania Transformer Div., McGraw-Edison Co. 19, 20
Petersen Engineering Co., Inc..... 83
Pfaff & Kendall..... 138
Phelps Dodge Copper Products, Corp.. 87
Pioneer Service & Engineering Co... 178
Preformed Line Products Co.....140, 141

Queensboro Transformer & Machinery Corp. 179

RT&E Corp. 53
Reichhold Chemicals, Inc. 147
Reliable Electric Co.....3rd Cover
Remington Rand Div. Sperry Rand Corp. 88
Revere Copper & Brass, Inc..... 18
Revere Electric Mfg. Co..... 153
Riley Stoker Corp. 14, 15
Rockbestos Products Corp. 155
Roebling's Sons Corp., John A..... 133

S&C Electric Co. 49
Sangamo Electric Co.....158, 159
Sargent & Lundy Engineers..... 165
Schuler Engineering Co. 154
Searchlight Section 181
Sierra Electronic Corp..... 146
Simplex Wire & Cable Co..... 82
Smith Co., S. Morgan..... 77
Southern States Equipment Corp...42, 43
Southwire Company 149
Square D Company 67
Superior Cable Corp. 172

Turner Electric Corp. 68

United States Rubber Co..... 70
United States Steel Corp..... 56
United States Steel Corp. American Bridge Div. 41

Wagner Electric Corp...57, 58, 59, 60, 61
Weaver Co., J. A..... 123
Westinghouse Electric Corp....12, 13, 37, 64, 78, 79
Westinghouse Electric Corp. Lamp Div. 127
Wheeler Mfg. Co., C. H..... 52
Wheeler Reflector Co. 156

York-Hoover Corp. 11

PROFESSIONAL SERVICES..... 181

CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES.... 181

EQUIPMENT
(Used or Surplus New)
For Sale 181

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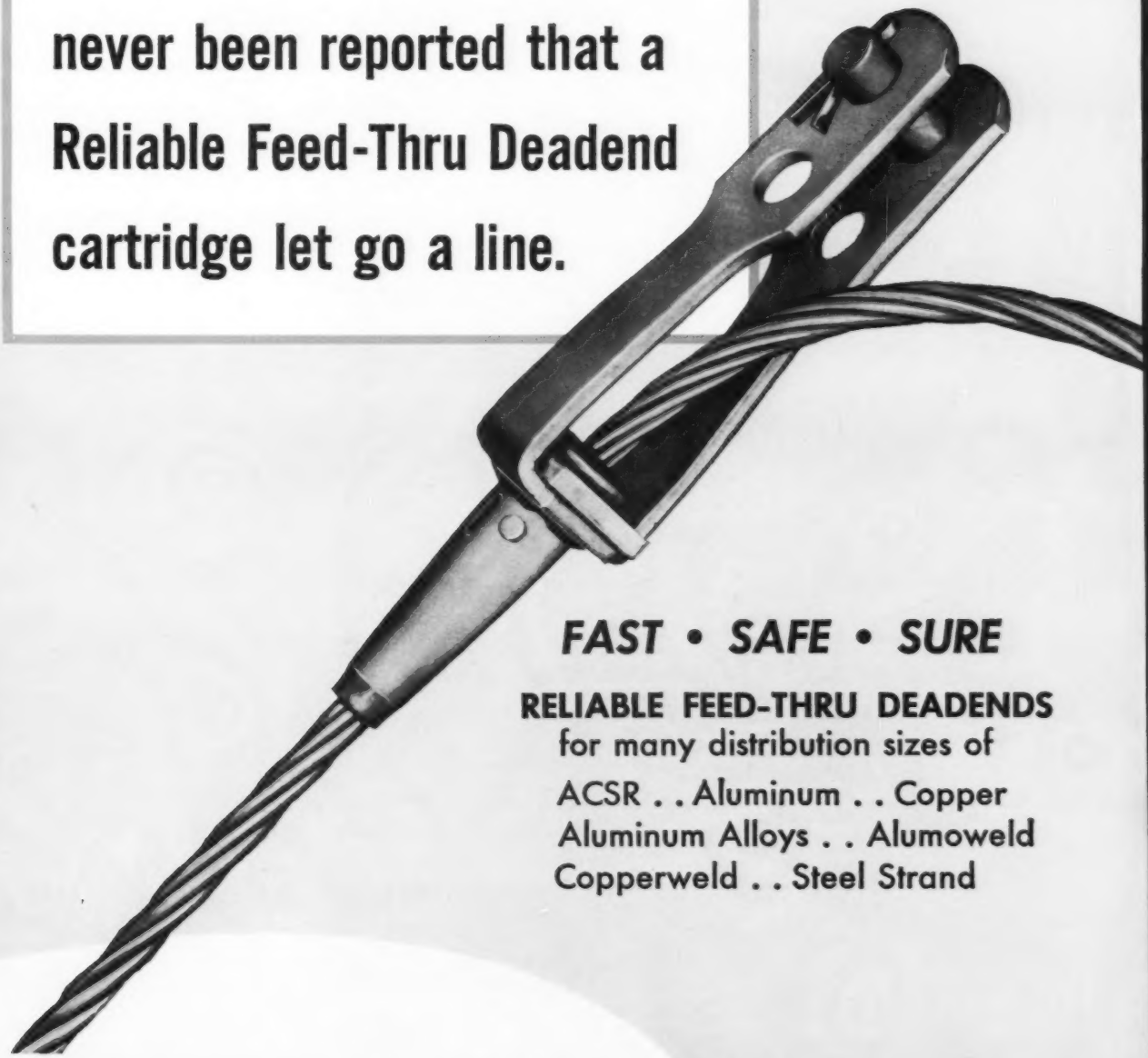

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- The new bushing configuration provides liberal creepage distance without excessive height, and also gives the porcelain high impact strength.
- Bushing connectors are tin-coated and large enough to accomodate either copper conductor sizes specified by EEI-NEMA Standards or the ACSR equivalent. Spring type washers and large contact surfaces assure positive contact and prevent conductor cold flow.
- All gaskets are completely retained.
- Cover mounted bushings are internally clamped, thereby reducing the amount of external hardware.
- Bushing mounting rim is rolled outward preventing the entrance of moisture. The smooth rounded surface of this flange eliminates corona at this point.
- CSP Transformers with a high voltage above 5 KV have the protective fuse mounted in the bushing. Fuse is easily replaced through the handhole.
- Protective caps are provided for cover mounted bushings.

These improvements result from Moloney's continuous research and development programs which have as their goal the improvement of all types of transformers.

Take advantage of Moloney's more than sixty years experience in the design and manufacture of transformers ... Specify Moloney Tranformers ... All Along the Line.

Protective Cap

WE 50-23

MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

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